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DOES COPPER NAPHTHENATE OXIDIZE CELLULOSE?

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MITIGATING against the extension of today's extremely wide use of copper naphthenate as a fungicide have been recurring rumors that copper compounds, in general, tended to catalyze the oxidation of cellulose. The authors have carried out the work covered in this article in an effort to find whether copper naphthenate had such an effect. It appears evident that this mildew-proofing agent may be used with no fear that it will tender fabrics or cordage through the promotion of oxidation.

During the last three or four years, considerable impetus has been given work in the field of "rotproofing" cellulose by the need for protecting large quantities of war material. The term "rotproofing" has been used to cover, rather loosely, the weakening and subsequent disintegration of cellulose by suitable microbial flora. The necessity for the use of rotproofing or preservative agents has been well known for many years in certain specific fields, particularly the field of wood preservation. Companies with a considerable investment in wood in the form of telephone poles or railroad ties, which must remain a long period in contact with or buried in the ground, have not found it economically feasible to use wood which has not been pressure impregnated with a suitable preservative. As an approximate example of the effects of preservative treatment, the life expectancies of treated and untreated fence posts may be quoted. In temperate climates a pine fence post, untreated, might be expected to have a useful life of about four years. The same type of post, pressure impregnated with preservatives before burial, might be expected to be in good condition after perhaps twenty-five years of use.

This spectacular increase in length of serviceable life is duplicated or perhaps even exceeded when suitable preservatives are used in canvas, osnaburg, or other fabric which, during its service, might logically be exposed to severe rotting conditions such as soil contact. Fabricated articles, such as tents, sandbags, tarpaulins or rope, may be expected to be exposed to such conditions. In actual service tests, the use of a properly selected preservative has increased the life of sand bags from two weeks to fifty-three weeks.

Among the myriad of materials which have been used as the basis for fabric preservatives, or as superficial preservatives for wood, copper naphthenate occupies an outstanding position. This product is highly toxic to cellulose destroying molds, possesses extremely low vapor pressure and water solubility, is highly resistant to hydrolysis, and possesses, because of its naphthenic acid content, a toxicity for copper tolerant molds or fungi not found in other organic copper salts. The versatility and toxicity to micro-organisms of this compound have placed it in many government specifications covering products in which extreme mildew resistance is required, and it will find even wider usage in the protection of cellulose for civilian use in the post-war period.

As mentioned previously, however, the belief that it promoted quick oxidation of cellulose has delayed the acceptance of copper naphthenate in certain fields where its rotproofing abilities would save much time, money, and material.

The work covered by this paper provides assurance that copper naphthenate does not catalyze the oxidation of cellulose and its use need not be feared because of this effect.

In order to cover the forms of fabricated cellulose fibers in which this tendering effect had been rumored, and in which the most damage would be done were it present, tests were conducted on the catalytic effect of copper in the oxidation of a ten-ounce cotton duck, cotton twine, and in jute roving. Cotton, of course, is the basic textile fiber which is most susceptible to rotting, and it was felt that jute fiber would be the most vulnerable of other cellulose fibers used in cordage. Tests were conducted using copper naphthenate as the source of copper, and this compound was used in sufficient quantities to deposit 0.6 per cent copper, as metal, on the weight of the cellulose. In addition to a good commercial grade of copper naphthenate, however, the examination was supplemented by work done with "copper naphthenate, cordage type," a product containing copper naphthenate and a lubricant of the type generally used in cordage manufacture. Its inclusion in the tests allowed the effects of lubrication and added water repellency to be evaluated. These are pertinent effects, since copper naphthenate would rarely be used alone in the cordage field.

Acting, also, on the assumption that a sort of reverse catalysis might compensate for an oxidative action of the copper, both copper naphthenate and copper naphthenate, cordage type, were checked alone and in conjunction with two materials which have shown themselves, in a variety of applications, to be strong oxidation inhibitors.

In certain cordage and textile applications it is occasionally desirable to use linseed oil, and this was accordingly checked as an additional additive.

The action of organic copper salts versus that of inorganic copper salts was checked by including copper sulfate in the series.

It was felt desirable to make the oxygen exposure conditions as severe as possible in order to limit the length of time necessary to secure significant tensile strength changes. Accordingly, the fabric specimens shown in Table I were exposed at 115° C. in a bell jar into which oxygen gas was constantly bled during the duration of tests. It was felt that perhaps

this temperature was too high and the tests might have to be repeated at a lower temperature, but this did not prove to be so, inasmuch as the untreated sample of ten-ounce duck only showed a tensile strength loss of 6 per cent during this period. The results of the exposure are covered completely in Table I. Unmodified copper naphthenate appeared to increase very slightly the tendency of fabric to lose tensile strength under these exposure conditions. It is open to question, however, whether the number of specimens examined was great enough to reduce the experimental error to a point less than the differences in tensile strength loss between untreated material and that treated with copper naphthenate. This point is rendered even more debatable by the performance of the proprietary copper naphthenate mixture, copper naphthenate, cordage type. Fabric treated with this product, in which the only additive is a hydrocarbon which cannot be assumed to have any effect on oxidative changes but would only influence lubricity, shows a distinct gain in tensile strength during the exposure.

As would be expected, no particularly significant effects are produced by the use of the supposed oxidation inhibitors since copper napthenate, in itself, was not found actively to catalyze oxidation.

An interesting evidence of the influence of physical characteristics of additives on the changes which take place in cellulose and during storage is given by the behavior of materials treated with copper naphthenate/linseed oil mixtures, versus those that are treated with linseed oil alone. Linseed oil is an active drying oil and under the conditions of tests would be expected, when used alone, to dry to a solid state, having no lubricating properties. There is no reason to presume that it has any oxidative effect on cellulose. It will be noted that, in Table I, there was no difference in behavior between the untreated control of fabric and fabric treated with linseed oil, both losing 6 per cent of their tensile strength during this test. Although copper naphthenate has been rumored to catalyze the oxidation of cellulose, it is a well known antioxidant for drying materials of the type of linseed oil. In conjunction with copper naphthenate, therefore, linseed oil should be expected to function as a lubricant. Copper naphthenate/linseed oil mixtures should approximate the performance of copper naphthenate/hydrocarbon oil mixtures. This expectation is fully borne out in the results of the testing, there being no difference in the behavior between copper naphthenate/linseed oil treated fabrics and copper naphthenate, cordage type, treated fabrics.

TABLE I

Effect of O_2 at 115° C. on Treated and Untreated Ten-Ounce Duck (48 Hour Exposure)

Treatment	*% Original Tensile Strength Retained*
Untreated control	94
Copper sulfate	16
Copper naphthenate	89
Copper naphthenate + inhibitor No. 1	93
Copper naphthenate + inhibitor No. 2	85
Copper naphthenate + linseed oil	111
Copper naphthenate, cordage type	111
Copper naphthenate, cordage type + inhibitor No. 1	108
Copper naphthenate, cordage type + inhibitor No. 2	105
Linseed oil	94

All copper treatments deposited 0.6 per cent copper, as metal on weight of duck.

TABLE II

Effect of Ultraviolet (Fade-o-Meter) Exposure on Treated and Untreated Ten-Ounce Duck (48 Hour Exposure)

Treatment	*% Original Tensile Strength Retained*
Untreated control	69
Copper sulfate	46
Copper naphthenate	75
Copper naphthenate + inhibitor No. 1	87
Copper naphthenate + inhibitor No. 2	87
Copper naphthenate + linseed oil	94
Copper naphthenate, cordage type	111
Copper naphthenate, cordage type + inhib.tor No. 1	93
Copper naphthenate, cordage type + inhibitor No. 2	90
Linseed oil	85

All copper treatments deposited 0.6 per cent copper, as metal on weight of duck.

TABLE III

Effect of U. V. (Fade-o-Meter) Exposure on Treated and Untreated Duck Exposed to Simulated Sea Water Before Test

Treatment	*% Original Tensile Strength Retained*	
	Exposed After Salt Water Immersion	*Rinsed in Fresh Water Before Exp.*
Untreated duck	57	50
Copper naphthenate	77	76
Copper naphthenate, cordage type	72	80

It is, of course, possible that in actual practice linseed oil may eventually oxidize despite the inhibitory effects of copper naphthenate. The above mentioned effects may not permanently be observable in actual fabric or fishnet treatments. They do further demonstrate, however, the anti-oxidative effect of copper naphthenate.

The most significant fact brought out by this preliminary work was that an inorganic copper salt, such as copper sulfate, produces an extremely severe tendering effect on fabric in oxygen at elevated temperatures.

The use of high temperature exposures in oxygen rich atmospheres placed very severe limits on the number of materials or treatments which could be checked at any given time. In order to by-pass this bottle-neck and also independently to determine the effects of ultraviolet light on treated cellulose, duplicate sets of fabric were exposed to ultraviolet light in the conventional "Fade-o-meter". This exposure, of course, is in a normal atmosphere. As shown in Table II, this alternate treatment allowed the same conclusions to be drawn with regard to the effect of treatment, although the order of magnitude of the differences was altered. The significant differences in the two methods of exposure are principally that all organic copper compounds, in Fade-o-meter tests, reduce the tendency of cellulose to lose tensile strength on exposure, and also that the effect of copper sulfate is then not quite as severe.

One of the fields in which the most interest was exhibited in the oxidative effects of organic copper soaps on cellulose, was the field of fish net preservation. Here, copper naphthenate is very nearly ideal as a preservative, since it protects nets against marine microbial attack and maintains this protection for extended periods because of its low water solubility. It also has a desirable high degree of anti-fouling action. It has been reported, however, that copper naphthenate functions perfectly as long as the net is in the water, but during the seasons when no fishing is being done and the nets are in dry storage, serious damage from oxidation resulted. In order to check this in a preliminary way, some of the treated fabrics, from which the data presented in Table I and Table II were gathered, were exposed to a 48-hour immersion in 3 per cent salt solution before being placed in the ultraviolet light. Some of these specimens were rinsed free of salt water before this ultraviolet exposure. The data presented in Table III was gathered from these treatments and shows conclusively that copper napthenate does not acquire catalytic properties, as far as oxidation is concerned, by exposure to 3 per cent sodium chloride solution. Actually, the properties of copper naphthenate appear to compensate for any destruction, oxidative or otherwise, which took place during the exposure cycle. The use of copper naphthenate reduces by 50 per cent the loss experienced by untreated cotton duck.

Replicates of specimens exposed to the oxygen bomb and in the Fade-o-meter were also given an exterior exposure test. Results of this exposure are shown in Table IV. Such testing may measure a number of factors other than oxidation but treatment with copper naphthenate does not seem adversely to affect the performance of cotton duck on such exposures. Here copper sulfate treatments do not seem to tender fabric, but the quick removal of the compound by rain explains this.

TABLE IV

Effect of 4½ Months Exterior Exposure at Elizabeth, N. J.

Treatment	% Original Strength Retained
Untreated control	65
Copper sulfate	60
Copper naphthenate	62
Copper naphthenate + inhibitor No. 1	62
Copper naphthenate + inhibitor No. 2	54
Copper naphthenate + linseed oil	66
Copper naphthenate, cordage type	64
Copper naphthenate, cordage type + inhibitor No. 1	63
Copper naphthenate, cordage type + inhibitor No. 2	67
Linseed oil	42

TABLE V

Effect of Ultraviolet (Fade-o-Meter) Exposure on Treated and Untreated Cotton Twine

	% Original Tensile Strength Retained		
Treatment	As Treated	Salt Exp.	Salt Exp. & Rinse
Untreated control	37	46	37
Copper naphthenate, cordage			
Copper sulfate	22	51	46
Calcium hydroxide	64	60	50
Pine tar	111	89	98
Copper naphthenate, cordage type	73	93	56
Copper naphthenate, cordage type + pine tar	104	92	94

TABLE VI

Effect of U. V. (Fade-o-Meter) Exposure on Treated and Untreated Jute Cordage After Simulated Sea Water Exposure

	% Original Tensile Strength Retained		
Treatment	Exposed as Treated	Exposed After Salt Water Immersion	Rinsed Water Exp. Before Exp.
Untreated control	96	90	58
Copper sulfate	51	67	70
Copper naphthenate + pine tar	108	83	84
Copper naphthenate, cordage type + pine tar	100	85	82
Pine tar	105	70	65

TABLE VII

Effect of Deslimeing Treatments

	% Original Tensile Strength Retained		
Treatment	Exposed as Treated	Exposed After Salt Water Immersion	Rinsed Fresh Water Before Exp.
$Ca(OH)_2$ (sat. solution)	77	89	87
$CuSO_4$ (.6% Copper on fabric)	51	67	70

There is no difference in the response of cotton to ultraviolet light or oxidative conditions as its physical form differs. Table V covers the results of tests on cotton twine, and these data again show a preservative rather than a degenerative effect of copper naphthenate, used here as copper naphthenate, cordage type.

Attention is called to the effect of copper sulfate on specimens which were not salt water treated. This exposure may be comparable to the dry storage of fish nets during the winter season. The copper sulfate treatment would be equivalent to the last deslimeing of the season. A tremendous loss of tensile strength is noted, 84 per cent.

The data gathered in this testing does not indicate that NaCl has any appreciable effect on cellulose in the presence of heat, ultraviolet light or oxygen.

In the final phase of this study, the effect of these same preservative substances was noted in treatments for juet fibers. Jute was selected, not because of its use by the fishing industry, but because it appears to be the cordage fiber most capable of degeneration, cotton excepted, Fade-o-meter testing was continued. The results of these tests are given in Table VI. Since it was desired to approach as closely as possible the conditions of fish net treatment and usage, the sources of copper naphthenate were compounded with pine tar, a commonly used fish net and rope preservative. 0.6 per cent copper was deposited on the fiber at a 20 per cent total loading. This corresponds, approximately to 6 per cent copper naphthenate 14 per cent pine tar.

In these tests, there was again no indication that copper as naphthenate had any adverse effect on the strength of jute fiber. Actually, copper naphthenate-treated specimens showed greater retention of tensile strength over the period of test than did untreated or pine tar treated controls.

Previous work on cordage fibers had not indicated that copper naphthenate was apt to catalyze oxidation. Manila hemp rope, for instance, treated with 1.5 per cent copper, as naphthenate, showed no loss in tensile strength on 11 months' laboratory dry storage.

A peculiar effect is noticed in the tensile strength changes taking place with untreated jute during this test. There is a markedly greater loss in tensile strength if the fiber is rinsed with fresh water before exposure to the Fade-o-meter than there is if it is exposed as it comes out of the simulated sea water bath. While this is the only instance of this effect shown in the published tables, the effect was quite common in a number of materials included in the tests but not of sufficient importance to be covered in this paper. It should be of interest to the fishing industry as it bears on the treatment of nets at the end of the fishing season.

The extreme tendering of duck by copper sulfate led to a retest of this chemical on jute. Since it is a commonly used deslimeing treatment it could be the source of considerable damage to fishing gear. Tests seem to indicate that its effect on jute is not as severe as its effect on cotton fiber but the use of copper sulfate still may produce very bad tendering during winter storage. If limeing is possible to remove slimes from nets it is definitely to be preferred since its tendering effect is only about half that of copper sulfate. Results of this work are given in Table VII.

Further work is planned with this phase of fish net treatment. It is felt that a review of the present tests can be made to further reduce experimental errors. There is, also, to be considered the effect of retreatment with preservative after accelerated aging. In this connection it is quite possible that any water repellent preservative applied over a net deslimed with copper sulfate may maintain this chemical in contact with the fiber for extended periods of time even after sea water immersion, and thus produce effects during immersion similar to those which this present study would lead us to believe happen in dry storage.

SUMMARY

Granting that the work outlined in this paper may require supplementing at some future time, it appears evident that it is improper to generalize about the effect of copper salts on the oxidation of cellulose. While copper sulfate seems to have such an effect and may be the origin of reports about this phenomenon, copper naphthenate does not appear to hasten oxidative degeneration of fabrics or cordage. It may, on the other hand, compounded with other materials which contribute beneficial mechanical effects, actually act as protection against oxidation as well as against microbial attack.

ACKNOWLEDGMENTS

The authors express their thanks to Mr. Frank E. Firth, of the U. S. Dept. of Interior, Fish & Wildlife Service, and Dr. William Clapp, of the Clapp Laboratories, whose belief that knowledge of the oxidative effects discussed would prove of interest to the textile industry, particularly as its products were used in fish nets, had much to do with initiating this work.

Thanks is also expressed to Miss Stella Moskowitz of the Nuodex Laboratories for her aid in securing the data presented.

BACK THE MIGHTY SEVENTH!

SOME FLAX FIBRE CHARACTERISTICS: THEIR BEARING ON THE BLEACHING PROCESS, S. A. G. Caldwell, "The Dyer and Textile Printer," page 291, Vol XCII, No. 8, October 13, 1944.

Flax fiber, upon its arrival at the spinning mill, contains impurities which necessitate a prolonged bleaching process. The method of retting and efficiency of the scutching operation have an important relation to the fiber dressing and bleaching processes, the methods of processing and the appearance of the finished goods.

The characteristics of a good quality flax are: a high degree of separation of individual strands which should be free from plant tissue; good weight for bulk; a soft cool feel; should retain the impression of the hand when crimped.

The quality of the fiber depends on the stage at which the straw is pulled and on the method and efficiency of the retting process. The correct stage for pulling is when the stems have turned yellow for one third of the distance up from the root and the lower leaves have begun to fall off.

The fiber system of a flax stem, which is composed of strands or fiber bundles, is located between the epidermis and the wood, and is imbedded in a layer of cortical and soft bast tissue. Pectic substances of the middle lamella are not sufficiently removed in retting, which makes essential an elaborate treatment incidental to linen bleaching.

The epidermis consists of an outer layer of waxy material and below this is a cutinized layer of cellulose and cutin. Both, to some extent, resist bleaching operations. The fiber, consisting of cellulose and hemicellulose, are purified by the bleaching process. The ultimate fibers, varying in length from ¾ to 1½ inches in length, are cemented together to comprise the main strands of the fiber system. In a properly controlled ret, the pectic material of the fiber bundles resists decomposition to a greater degree and allows the fiber strands to be freed without loss of strength.

There are two systems of retting the flax: water retting and dew retting. In water retting the straw is steeped in dams, ponds or rivers in the open or retted under more positive control in tanks. Water retting may be effected by natural agents present in the soil or water or may be made more effective by raising the temperature of the water, controlling its rate of flow, and introducing chemicals. Pond or dam steeped flax is usually darker than river or tank steeped flax. River and tank steeped flax varies in color from silver white to cream and possess a lower percentage of extraneous material. The products made from it are more easily bleached and finished.

The process of dew retting fiber is practiced mainly on the continent, on low grade straw because of its cheapness. Due to the greater amount of extraneous plant tissue and coloring matter present, it demands a more drastic treatment in boiling and bleaching processes.

To distinguish between pond retted fiber and dew retted fiber, which are very similar in appearance, a small quantity of the material is boiled with a piece of water retted flax of approximately similar color in a soda ash solution. When removed and dried, the water retted material has turned a cream color and the dew retted sample maintains a definite blue gray appearance.

There have been found many uses in the linen industry for unretted flax fiber through the recently evolved system of decorticating. If the unretted flax is introduced into a boiling process, prior to spinning, and preferably in the condition of roving, the material can be wet spun to medium counts suitable for the manufacture of damask and allied fabrics.

The strength of the solution (caustic soda or soda ash) used in roving boiling depends on the required weight reduction. It has been found that the yarn strength, appearance, and uniformity increases with the weight lost in boiling. For spinning to medium wet spun counts, the loss in roving boiling may be 20-25 per cent. The spun yarn is light colored and can be bleached to a full white with a further loss of 8-10 per cent.

PATENTS SHOW POSSIBILITY OF LIGHT-PRINTING ON CLOTH, Linton C. Reynolds, "Textile World," page 133, No. 4, Vol. 95, April, 1945.

Textile printing, as it is now being done with engraved rolls imparting the pattern to the cloth, is essentially the same as practiced in the 19th century. Current improvements involve the use of resins as binders for holding pigments on the cloth but the printing still involves the same mechanical methods that have been in use for years.

It is suggested that some day it may be possible to print cloth with light rays. It is now possible to impart a photographic image to cloth by allowing light to pass through a negative upon a light sensitive emulsion on the cloth. The image produced is either black or sepia colored but the cloth itself is not colored.

In recent years considerable work has been done with color photography and the use of dyes in emulsions and it is possible that some of this knowledge may be applied to cloth printing. Two possible methods of printing textiles are suggested. It is acknowledged that the cost will be many times the cost of present-day printing methods; however, most of the silver used in the process can be reclaimed. With increase of knowledge and improvement of methods it is possible that their use may become more practicable.

Possible advantages claimed for the process are: length of repeats would be practically limitless; no print rolls to scratch; no doctors to file or lint up; no heavy sets required; delicate tones and variations in depths readily possible.

SCOURING MULTI-COLOUR WORSTED PIECE GOODS, "The Dyer and Textile Printer," page 61, No. 2, Vol. XCIII, January 19, 1945.

Multi-color worsted piece goods may prove troublesome to scour as a proportion of the dyestuff on the goods may bleed off causing staining. Among the causes of this bleeding for which the dyer is to blame, the following are listed: (1) the use of an inordinately high proportion of acid milling shading dyestuff along with the chrome color forming the foundation of the shade; (2) wrong usage of bichrome during the application of the chrome color; (3) misapplication of the acid exhaustant for the dyestuff; (4) use of an organic acid exhaustant by itself with dyestuff that can only properly be exhausted and completely fixed on the animal fiber with the assistance of a mineral acid; (5) failure to thoroughly remove all loose color from a slightly dirty dyeing, during the washing-off process for the yarn or slubbing.

Among the mistakes which might be made by the scourer are the following: (1) the use of an excessive quantity of ammonia, or of soda ash, in a bath at an unduly high temperature; (2) the employment, as a supplementary detergent, of an over-generous quantity of a proprietary grease-removing preparation.

It is suggested that scourers who suspect the fastness of the dyestuffs on a multi-colored worsted piece should process the goods in a cold, or barely lukewarm, solution of the detergent and use warm water only at the end of the process. The use of creosote soap is also suggested.

"ARDIL": A PROTEIN SYNTHETIC FIBER FROM PEANUTS, David Traill, "The Textile Manufacturer," page 71, No. 842, Vol. 71, February, 1945.

"Ardil" is the registered trade mark for fibers made from the proteins in the ker-

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CALENDAR OF COMING EVENTS

Mettings, Council and Research Committee, Hotel Commodore, New York City, June 22, 1945. Chairmen of Sub-Committees who wish to hold meetings on June 21st at the Hotel Commodore should notify Dr. Louis A. Olney.

Outing, Philadelphia Section, Melrose Country Club, June 22nd, 1945.

OTHER ASSOCIATION MEETINGS

Meeting, American Association of Textile Technologists, Builders Club, New York City, June 6th, 1945.

Some Recent Aspects in the Finishing of Textile Fabrics With UREA AND MELAMINE RESINS*

ALDEN D. NUTE

Calco Chemical Division, American Cyanamid Co.

AS the title suggests, this paper will attempt to cover not only the more common applications of the urea and melamine formaldehyde resins, but will indicate by specific examples the comparative value of these two classes of resin materials when applied to textile fabrics.

Most of us already know that several important applications of synthetic resins have been known for the past ten or fifteen years, more specifically those applications involving the urea-formaldehyde resins which were and still are used for producing crease resistance and shrinkage control in light weight cottons, spun rayons, and spun rayon mixtures. In this connection, the patent of Tootal Broadhurst and Lee of Manchester, England, U. S. No. 1, 734,516 which was issued in 1929 and which expires in November of next year covers specifically the production of crease or crush resistant finishes in cellulosic and other materials. Claim 7 is of extreme importance during the life of this patent and reads as follows: "The process of rendering a textile material substantially less liable to creasing or crumpling without substantially lessening its suppleness, which comprises impregnating the individual fibers with a liquid comprising a solidifiable agent, removing the impregnating agent, if any, from between the fibers, and solidifying the agent."

This process was developed originally specifically for cottons, but as we all know would never have assumed its present importance for such applications. Actually, it was the market for spun rayon dress goods and various types of sportswear which caused the rapid and phenomenal growth in the use of this method. Incidentally, this crease proofing process yieds also shrinkage control, an improvement in hand and drape, as well as an increase in wet tensile strength. On the other hand, the wear or abrasion resistance is normally decreased, unless other materials are added to the resin impregnating bath to overcome this defect. In many instances, too, fabric stabilization is achieved by this type of application, although in some cases this factor may not be of very much importance.

Thus we see that in the case of spuns and spun rayon mixed fabrics we are able by a single complete process to obtain crease resistance, shrinkage control, fabric stabilization, increased wet tensile strength, as well as improved hand and drapability.

Up until the war began in 1941, the urea-formaldehyde low polymer products were practically the only types of thermosetting resins available for producing these results. But with the advent of the melamine formaldehyde materials, the field of resin applications for textiles was broadened considerably.

It may be well at this point to mention some of the usual applications where either of these two types of resins may be used to produce approximately equivalent results. This term, "approximately equivalent" is used advisedly, as in most instances, the advantages of the melamine type, such as stability to storage, ease of handling, and improved final effects, more than compensate for its somewhat higher initial cost. Both types are now used to produce permanent glazed chintz in cottons, crush resistance in transparent velvet, as well as crease resistance, shrinkage control and fabric stabilization in cotton voiles or lawns, spuns and spun rayon mixtures, linen and other fabrics.

It was no simple matter to take melamine, which is a triamino-triazine and combine it with formaldehyde to yield a product that would be satisfactory to the textile trade for applications to practically all types of fibers, including wool, rayons, cotton, linen, Aralac, and nylon. However, after several years of intensive, painstaking research work at the Stamford Laboratories of the American Cyanamid Company, an alkylated methylol melamine was produced which was the answer to a textile man's prayer. Here, in a water clear or slightly hazy syrup of approximately 80 per cent resin solids and a pH of 8.0, we found qualities that had seemed impossible of attainment during the previous years. In sharp contrast to the corresponding urea-formaldehyde types, this product is miscible with cold water in all proportions and has excellent stability to storage. In order to obtain equivalent results in any given fabric construction, it is necessary to apply one-half the amount of melamine resin. In other words, a melamine-formaldehyde resin content of 5 per cent solids in a fabric is equivlent to roughly 10 per cent solids of a corresponding urea-formaldehyde product.

Another difference of extreme importance between the two types is their manner of chlorine absorption, from laundry bleach liquors. As is well known, the urea-formaldehyde resins absorb chlorine to cause subsequent tendering during hot ironing, in either cotton or spun rayon fabrics, unless such fabrics are given a thorough anti-chloring. On the other hand, although the corresponding melamine types likewise absorb chlorine, they do so in an entirely different manner, with little or no subsequent loss in tensile strength, even though anti-chloring is omitted. Chlorine absorption tests carried out by several independent laboratories showed that whereas a spun rayon fabric that had been finished to have a urea-formoldehyde resin content of eight per cent gave tensile strength losses varying from twenty-two to sixty pounds per inch in the warp and twelve to twenty-seven pounds in the filling, the corresponding melamine-formaldehyde finished fabric showed practically the same loss as the cloth before finishing, namely, six per cent. The important factor in connection with this investigation is the fact that the urea-formaldehyde treated cloth showed such a wide variation in tensile strength loss, whereas the corresponding melamine - formaldehyde finished sample did not.

Probably the most remarkable difference between these two types of resin materials is their respective effect on the shrinkage control of wool and wool mixed goods. Certain melamine - formaldehyde products show, in general, excellent results when applied to leave six to ten per cent resin in a fabric which is in distinct contrast to the comparatively poor effect produced by the customary urea - formaldehyde types.

This process for controlling the shrinkage of wool by means of a melamine resin is covered by U. S. re-issue patent No. 22,566 granted to the American Cyanamid Company. The name of the particular resin product sold for this specific

* Presented at meeting, New York Section, March 16, 1945.

purpose by this company is known by the trademarked name of Lanaset.

Most of our work so far has been with fabrics, rather than with raw stock, tops, warps, or skeins. Experimental work to date indicates that methods may be worked out to handle wool successfully in any of these forms, but considerable time and effort will be required before such processes are used in large scale production.

On the other hand, the methods of handling woven fabrics and knitted goods in cut form have been developed to a point where large scale production may be carried out successfully. That such is true is attested by the fact that a government procurement of 750,000 yards of a 21-½ oz. all-wool O.D. woven blanket fabric was handled for shrinkage control with melamine-formaldehyde resin in 1943. In this case, the specification was set for not more than five per cent shrinkage in the warp, nor more than two per cent in the filling after three wool launderings. It is of considerable interest to note that whereas this fabric construction normally has a shrinkage of approximately ten per cent in both warp and and filling, we were able to maintain large scale production figures well within the limits set up by the Quartermaster Depot.

Of the four plants handling this procurement, one impregnated the goods in the wet state and napped after completing the resin treatment. Another followed a similar procedure, but impregnated the dry fabric, napping as a final operation. A third plant napped their goods before resin impregnating, drying and curing in a single operation, while the last plant operated in a similar manner, but the drying and curing were separate treatments. Although no definite conclusions were made as to which method yielded the best results, it was felt that the plant operating the continuous method of impregnating, drying and curing in a straight line operation produced the most uniform and satisfactory results.

The methods of handling this particular cloth construction may be considered as good standard practice for treating most wool or wool mixed fabrics. As we all know, no single set of instructions will cover every type of cloth. In fact it is practically an impossibility to issue a set of instructions for any one fabric construction, which will yield equally satisfactory results in every plant due to the variation in equipment and methods of handling. However, a wide variation in processing technique may produce equally good control. To give a concrete example, a 12-ounce all-wool O.D. lining fabric was treated in one plant by impregnating wet with Lanaset — a thirty second immersion —followed by drying in a pin tenter dryer, with the heat curing at 300°F being effected by a second run through this same pin tenter. After scouring in a dolly washer, the goods were dried to width in the pin tenter in the usual manner. In a second plant, the sample cut was impregnated dry with the same strength of bath — a six second immersion — dried in a pin tenter, cured by a second run through this dryer at 300°F, washed in a dolly washer, and dried to the same width as in the first instance. In the first case with a weight increase of 8 per cent, the shrinkage figures after three launderings were 3.7 per cent in the warp and 2.4 per cent in the filling, while the corresponding figures in the second run, with a weight increase of 12 per cent, were 2.9 and 0.6, respectively. In marked contrast, this fabric without the resin treatment showed figures after three launderings of 18.5 per cent in the warp and 5.8 per cent in the filling.

In general, these remarks covering the Lanaset applications to all wool fabrics are true also of the mixed fiber constructions. Naturally, there is a best way to handle each cloth construction and no large scale production should be started until preliminary examination indicates this optimum method.

Other applications where the melamine-formaldehyde resins yield much superior results over those obtained with the corresponding urea - formaldehyde products are tabulated as follows:

A. The production of shrinkage control, in combination with water repellence and mildew resistance in cotton insect netting for the armed services, both plain O.D., as well as the printed camouflage netting.

B. The treatment of nylon insect netting. and screening for the Army to meet the specifications for fabric stabilization and other properties. In this case, the most efficient method of handling is to apply in a single bath operation, the melamine-formaldehyde resin, alone or in combination with an alkyd resin, together with the pigment mix to produce the desired O.D. shade.

C. The improvement in the fastness to laundering of certain classes of dyestuffs, notably direct and sulfur colors. More specifically, this is true of directs on both cottons and spun rayons, and of sulfur colors on cottons. In many instances, this improvement is truly remarkable.

As far as equipment is concerned, we feel that for practically all types of fabrics it is best to use a heavy pad mangle for the melamine resin impregnation. Since each type of cloth will wet out and pick up resin to a different degree, preliminary laboratory trials are necessary to determine the proper method of handling each construction. While a 3 bowl hydraulic or air pressure mangle is to be preferred, excellent results have been obtained with the customary two bowl mangles, provided the machines gave a heavy squeeze or tight nip.

To obtain the best results, the mangle and tenter frame, either clip or pin, should be in tandem, in order to have a continuous run of goods. If the dryer is large enough, it may be possible to dry and heat cure in a single operation.

For 10 ounce wool fabric, the total drying and curing time at 300°F may be roughly eight to ten minutes, whereas for 21-½ ounce lining the interval would be nearer twenty minutes. If the dryer is operating at a lower temperature, the time interval must be increased, while the reverse is true for temperatures above 300°F. If these same constructions have been dried in a separate operation, these curing times may be cut in half. A washing of the cured goods is usually carried out in order to remove surface resin, as well as to neutralize any acidity which may be present. The goods are then dried to width and given any final dry finishing operations which may be required.

From these remarks, it becomes apparent that while the customary urea-formaldehyde resins still have a place in the textile finishing field, the melamine products are displacing them to an ever increasing degree. These latter materials are likewise opening new fields of application, in which the older resin types do not prove at all successful. Although considerable progress has been made in the development of new synthetic resin products during the past few years, even greater strides may be forecast for the future, when this country of ours is able to turn from a successful conclusion of the war to normal peacetime pursuits.

Some Aspects in the Finishing of COTTON MARQUISETTE NETTINGS With Cellulose Derivatives*

JOSEPH E. GOODAVAGE, CAPT., QMC
Philadelphia Quartermaster Depot

THE Quartermaster Corps supplies shelter, food, and clothing to our fighting forces all over the globe, and in addition, certain items of equipage which play an important role in maintaining the physical well-being of the soldier by protecting him against disease such as malaria, sandfly fever and sleeping sickness.

While it is impossible to evaluate statistically the protection afforded the soldier by such items of equipage as the field bar, the headnet and the jungle hammock, it can be said that without such protection, the soldier would be exposed to conditions as serious, and possibly more so, than if he were sent into battle with no means available to defend himself.

The importance of netting in present warfare is well expressed by Colonel Robert L. Scott, Jr., former Fighter Commander of the China Air Task Force under General Chennault, who stated in an interview covering his experience in Burma: "Your best bet is to take every precaution from getting malaria. Never go without your shirt, however hot it is, and keep your sleeves rolled down; wear gloves when possible, and tie a string or a piece of plant fiber around your sleeves at the wrists. Keep your trousers tucked in your G.I. shoes and never, under any circumstances, be without a mosquito headnet. I'd go without food if I had to make a choice between food and mosquito netting when I made up my pack of things to carry into Burma. In fact, I'd take a mosquito net if I had to carry it in my mouth. It's that important.

"Frequently at sundown, standing on some rising ground, I noticed a haze in the valleys which at first I thought was a ground fog. The superstitious Burmese would say, pointing to it, 'Look, the Curse,' and indeed it was, but not as they supposed it. That miasmatic haze consisted of myriads of the *Anopheles*, or malaria-bearing mosquitoes, which swarm at sundown and are particularly obnoxious for three or four hours thereafter. Don't say, 'Oh, mosquitoes never bother me.' These mosquitoes are hungry and aren't particular."

Such words of praise of an inanimate item—the product of an industry that lacks glamour of the Aircraft or the munitions industries — one that is looked upon as a non-essential industry, is a testimonial of the high regard that the fighting man has for the environmental protection that netting affords in jungle warfare.

Netting has been a Quartermaster item since at least as far back as 1879 when it was used for mosquito bars and was procured as mosquito netting. It was bought against a standard sample which it was to equal in quality. Headnets and field bars were supplied the troops in the Spanish-American war.

Netting was procured on this basis until July 1908 when the specifications called for "bobbinette equal in quality to the best English, counting not less than one hundred and eighty-two meshes to the square inch." A specification issued in 1915 for Alaskan clothing required that headnets be made from bobbinette netting.

In World War No. 1, field bars made from Nottingham, Raschel, and bobbinette netting were in use. After World War No. 1, bobbinette netting was adopted as the standard netting.

This type of netting was used for garrison bars, headnets and also for shelter tent bars up until 1940 when it was realized that other sources of supply would have to be located to meet the demands of the rapidly increasing Army, since there were only 75 bobbinette machines in the United States with a total available production of five million yards.

The supply of netting was augmented by accepting suitable fabrics made on the Levers, Nottingham and tricot machines. While these types were satisfactory from the size of the mesh, it was impossible to obtain a netting to meet specification requirements in that excessive shrinkage was a problem which the knitting industry was not able to overcome at that time. Early in 1941, the Textile Section of the Phila. Quartermaster Depot developed a suitable woven netting using a leno weave construction.

While this type of netting was available in quantities to meet the constantly increasing demands of procurement, it had one serious fault; namely, slippage of the threads. This defect was soon overcome by applying the Heberlein finish (a sulfuric acid treatment) which gave the fabric a satisfactory hand, good draping qualities and stabilized the weave structure. This was the first application of a permanent type finish to netting procured by Phila. Q.M. Depot.

At about the same time a progressive tricot manufacturer, cooperating with the depot, submitted the first sample stabilized with a cellulose finish in which pigment coloring was incorporated.

In 1942, it was decided to standardize the netting so that one type would be suitable for use in the headnet and the field bar, and to develop a fabric with a fine mesh which would be suitable for tropical use. In addition, the netting was required to be made mildew resistant and water repellent.

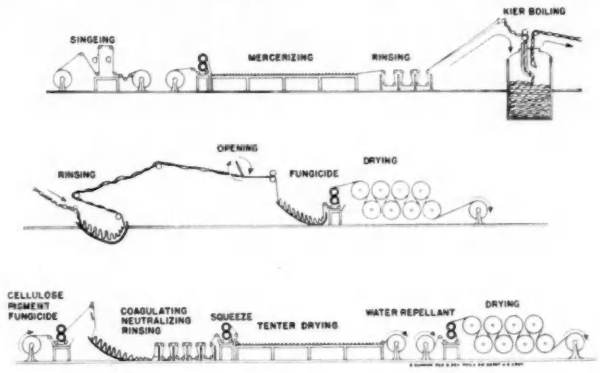
As a result of this change, the present marquisette netting differs from that procured by this depot originally in that it has two additional picks which are pushed closely together, and are tightly bound by the warp threads, forming well defined openings and resulting in a mesh of .03 to .0325 inch, having a maximum weight of 1.8 oz. per square yard and a breaking strength of 28 pounds in the warp by 20 pounds in the filling with a total of 625 to 676 meshes per square inch.

The cotton marquisette insect netting is now the substitute standard netting from which bars, insect, field; mosquito headnets, and the netting for jungle hammocks is made.

The development of the cotton marquisette netting has made available a material superior in strength and more durable than the bobbinette which was the standard up to 1940. In addition, it is estimated that a saving of approximately $30,000,000 has resulted to the Army by this change. From March 1941 to March 1945, the yardage of cotton marquisette netting procured by Phila. Q.M. Depot amounted to approximately 250,000,000 yards. This yardage would cover an area of approximately 87 square miles or would completely cover the whole Borough of Brooklyn with some 10 square miles of

* Presented at meeting, New York Section, March 16, 1945.

FINISHING COTTON INSECT MARQUISETTE NETTING



netting left over.

The characteristics required in a netting which is designed to give maximum protection in tropical areas to the fighting men are:

Maximum visibility,
Stability of weave structure,
Durability,
Resistance to Mildew.

While it is recognized that uniformity and strength of yarn coupled with good weaving constitute the important foundation which determines to a great extent the serviceability of the netting, the cumulative effect of the finishing operations is equally of importance in arriving at a satisfactory product.

The finishing routine of netting will vary somewhat in each plant, depending upon the equipment available. In general, it will follow the flow sheet illustrated.

With your permission, I will skip over the preliminary operations of singeing, mercerizing and kier boiling and go to what I consider to be the most important operation—the application of the cellulose finish.

The cellulose compounds in general use are of two types. While they differ chemically, they possess one common property, in that they are soluble in caustic soda.

The type marketed as Ceglin is the hydroxy ethyl ether of cellulose, and the other type is a purified form of cellulose which is put into solution in caustic soda with the aid of sodium zincate. This type is marketed as Celfon and also as Kopan.

The application of the cellulose solutions to the netting, which has been previously dried, is carried out on a two-bowl pad. The rolls are made of rubber, or one of rubber and the other of stainless steel, or monel, or iron can also be used. Since the caustic solution of cellulose is quite slippery, it is necessary to drive both rolls. Pigments and a fungicide are dispersed in the cellulose solution which is constantly agitated by a beater located in the bowl of the pad. Indirect steam heat with a thermostatic control maintains the temperature of the pad solution at 80° F. The netting enters the pad bowl travelling through the padding solution under two immersed rolls and then into the nip of the pad rolls with the pressure adjusted to yield about 5 per cent cellulose on the weight of the netting. On leaving the pad, the netting is plaited in folds into a scray or is rolled up on rolls and then delivered to the coagulating bath. The coagulating bath contains a 3-5 per cent solution of sulfuric acid at a temperature of 75°-80° F. The netting in open width is guided through this over immersed rolls. The action of the sulfuric acid is two-fold. It neutralizes the alkali necessary to keep the cellulose in solution, and thus renders it insoluble. It also renders the fungicide insoluble; that is, the phenolic types, by changing the soluble sodium salt to an insoluble compound.

Following the coagulating operation, the netting is subjected to a series of rinses followed by a soda ash neutralization, and a final thorough rinse from which it is delivered to the tenter dryer.

Tenter drying is necessary in order to obtain maximum shrinkage control by imparting a "set" to the netting which controls the degree of shrinkage and is due to the cohesive force of the cellulose compound which also acts as a binding agent holding the pigment and the fungicide firmly to the fiber.

I would like to call your attention to the necessity of thorough penetration of the fiber by fungicide. It has been found through experience on fabrics submitted to Phila. Q.M. Depot that occasionally edge-growths occur on samples submitted for mildew tests. In these samples, it appears that there is sufficient fungicidal protection on the surface, but when a sample is cut and inoculated, the hyphae of the test organism will find an unprotected core in the fiber, and since these hyphae are many times finer than the individual cotton hair or fiber, they are able to penetrate and actually destroy it. For example, in a sample measuring 1 x 3 inches, hyphae were able to penetrate to the extent of ¼" all around the cut fiber, and when this fabric was subjected to a strength test, it was found that it had lost 40 per cent of its original strength.

The application of the fungicide, when carried out simultaneously with the cellulose compound, in most cases is not sufficient, and therefore, in order to eliminate the edge-growths, it becomes necessary to pretreat the fabric with a fungicide application before padding on the cellulose compound. It has been found that the application of a soluble type fungicide, usually the sodium salt, when dried in the fabric after the kier boiling operation, insures a thorough penetration of the fiber and eliminates edge-growths.

Finished cotton insect netting marquisette on arrival at the Philadelphia Quartermaster Depot must conform to the following physical requirements:

Weight per square yard	1.8 oz.	
	Warp	*Filling*
Thread Count per inch.	50-52	50-52
Breaking Strength 1x1x3 Grab Pounds (Min.)	28	20
Mesh per sq. in.....	625-676	
Size of hole (Max.)...	.03 x .0325	

In addition, it must satisfactorily meet the following performance requirements:

Shrinkage—Not to exceed 8 per cent in the direction of the warp, nor 8 per cent in the direction of the filling, when tested for "shrinkage in laundering" as outlined in Section XIV, Federal Specification CCC-T-191.

Finish—The finish of the netting shall be of such a character as to make it resistant to slippage of the warp threads along the filling when subjected to three launderings according to Section XIV, Federal Specification CCC-T-191.

The instrument used in evaluating slippage is illustrated in PQD Test Methods for Textiles No. 447A.

Fastness to Water—A specimen of the colored material, measuring about 2 by 5 inches, is taken for test. Approximately 2 inch square pieces of undyed wool or test cloth, with various fiber floats woven into it, and bleached but not starched cotton cloth are sewed or otherwise firmly attached to opposite ends on the same side of the test specimen. The specimen is weighed, air dried and successively immersed in distilled water at 80 degrees plus or minus 5 degrees F., and passed flat through a wringer several times until the amount of solution retained is 100, plus or minus 10 per cent. The specimen is then tightly wrapped with undyed pieces inside, around a glass rod. The rod

(Concluded on Page P240)

The A.A.T.C.C. Surveys the Informative LABELING OF TEXTILES*

HENRY F. HERRMANN
General Dyestuff Corp.

THE informative labeling of textiles is referred to as the problem child of the industry and this is due to the large number of groups which are concerned with it and the lack of understanding of each other's problems, coupled with a certain amount of suspicion that one's individual rights are being trespassed on. Since our Association occupies a central point in any discussion on informative labeling we should acquire a very clear understanding of the problem and maintain a definite policy toward it. In many articles on this subject informative labeling has been viewed in a very broad panoramic way and the principal object was to determine whether informative labeling is a good thing for all parties concerned and as such should be supported by our Association, or whether it encompasses undesirable features or even evils in consequence of which it should be opposed.

If my appraisal of the general attitude of the various factors involved in informative labeling is accurate, the overall sentiment is favorable but there is considerable misgiving over the modus operandi. Quite naturally the consumer and retailing interests are very outspoken in their desire for labeling to be put into effect as soon as possible. The converters, dyers and finishers and manufacturers are much more reserved in their acceptance but seem to take the attitude that they are facing the inevitable and the best they can do is to insist upon a labelling plan which will be workable and fair.

In order to arrive at a clearer picture of the informative labeling problem as I see it, I will review briefly the arguments for and against it on the part of the principal groups or factors which are concerned with it, namely—

No. 1—Consumer
No. 2—Retailer
No. 3—Distributor and converter
No. 4—Dyer, printer, finisher
No. 5—Garment manufacturer
No. 6—Dyestuff manufacturer
No. 7—Cleaning industry
No. 8—Governmental control agencies
No. 9—A.A.T.C.C.

The present discussion will be confined as much as possible to the technical phases of informative labeling, stressing color fastness and special finishes. Other phases will be touched upon only when necessary. The basis of informative labeling is "information." A few pertinent questions are—

Who has this information?
Whose obligation is it to supply it?
Whose responsibility is it that the data be correct?
How much information is to be given to the public; in what manner and in what language?
Where do legal requirements commence and leave off?
How much of the customary advertising material is permissible in conjunction with the factual data?
Should labels be permanent?

On each of these points there will be divergent opinions as we review the attitudes and interests of our principal groups.

THE CONSUMER POINT OF VIEW

Undoubtedly the consumer is the principal beneficiary from a factual labeling program and the insistence for immediate action in this direction is the result of the pressure of consumer organizations. The principal difficulty with informative labeling for consumer use is the question of terminology and this involves an educational campaign for which co-operation between the industry, consumer groups and government agencies is absolutely necessary. I do not wish to become involved here in the question of label terminology but will refer to it again in a more appropriate part of this talk.

The consumer will profit from labeling because it will permit him to purchase intelligently, help him to locate the fabrics and garments having the service elements which he requires, and to determine what price he must pay to get what he wants. It is believed that informative labeling will militate against nationally advertised brands but in my opinion this is by no means a foregone conclusion. The public buys fabrics and garments on the basis of eye appeal, which means fit, style, color and visible quality features, such as, texture, hand, weight, drape, etc., etc. The factual label then comes into action by revealing the hidden properties which have a direct bearing on the selling price and which might otherwise be overlooked. These factors are, color fastness with respect to light and washing; the presence and durability of special finishes, such as anti-crease, controlled shrinkage, mothproofing, waterproofing and many others. In addition, there comes into play the ordinary consumer psychology of preferring, through established confidence, a familiar brand name. If all quality features are equal and the price premium is not too high the familiar brand still has the first call. In no other merchandising fields is the buyer confronted with the uncertainties with respect to the true character and worth of a proposed article of purchase as is the case with textiles. Without wishing to appear to take sides on the question I do believe that the manufacturer can reveal as much about textile lines to the consumer as other industries do, such as manufacturers of automobiles, refrigerating and washing equipment, radios and a host of others. These trades have educated their customers to look for and appreciate important features contained in their respective articles and apparently benefit thereby, and the same will eventually happen when textiles are merchandised in this manner.

THE RETAILER'S POINT OF VIEW

The successful retailer must please his clientele and in the selling of garments and other textile materials this means an over-the-counter description of the value of the merchandise which is being offered. Assuming that the store's policy is to be accurate in its claims, it faces the great difficulty of obtaining the required information from its sources of supply. The word of wholesale salesmen, the recollection by store buyers regarding what was claimed by solicitors, together with the eye evaluation of merchandise by this fraternity which is not always as accurate as they are inclined to credit themselves, are a very poor medium or, at best, an unreliable one for conveying factual information from the manufacturer to the ultimate consumer. Many large department stores operate expensive testing laboratories; others use the facilities of consulting laboratories to grade doubtful merchandise—to test the reliability of unfamiliar sources of supply and to evaluate job-lot offers. This is fine as far as it goes but it is out of the question for any store to examine and grade all of the textiles it sells. In fact, I believe that in most

*Presented at meeting, New York Section, May 18, 1945.

cases the majority of merchandise has not been tested and quality claims which are made over the counter are without factual support. If the store personnel consisted wholly of experts of many years trading experience in the particular lines which each group handles, this unsatisfactory situation would present its most favorable aspect and, as the saying goes, the store would deserve an "A" for effort. Unfortunately, the selling today is largely done by young people (temporarily altered by the military situation) and with the shifting of personnel from store-to-store and department-to-department real experience is encountered very rarely and with the best of intentions to educate their personnel the retail stores nevertheless require outside assistance. This is definitely and clearly supplied by universal factual labeling.

The fear is voiced that informative labeling will disturb present price levels; that consumers will refuse to pay a fair price for the so-called commercial grades of materials which do not embody outstanding features of color fastness or special finishes. I do not share this view. There will always be a market for moderately priced merchandise to suit the purses of the so-called common people and of the indiscriminate buyers who, for the purpose in mind, are more interested in a low price than in durability or needless high quality. After all it is the careful buyer whom we aim to please. The person that knows, or thinks he knows, what he wants and who can be easily convinced through an informative label that he has found his goal will be glad to pay a fair price in return. This closes the sale as far as the retailer is concerned because the responsibility for the accuracy of the information on a label is on the shoulders of the manufacturer who supplied it. This process should correct not only over-selling of quality with its ensuing claims, but also of underselling through ignorance of merit and consequent loss of profits.

THE DISTRIBUTOR'S AND CONVERTER'S POINT OF VIEW

We can take for granted that anything that benefits the retailer will also be acceptable to the distributor and converter and his chief problem is to obtain from the manufacturer the required merchandise and descriptive data. This has been difficult while labeling was on a voluntary basis but should not present any problem if the government orders mandatory labeling. The distributor has been accused of indifference with respect to supplying factual information and we have even heard of instances where labels were lost or changed while merchandise passed through his hands. Under the new plan the orders placed with him will designate required properties and will have to be filled accordingly. He, in turn, will have to order his procurements on this basis if he does not have the merchandise in stock.

THE DYER, PRINTER AND FINISHER

Since we are talking only about the chemical aspects of textiles, namely, color and finish, the brunt of a factual labeling program falls on the processing industries. Mills which do their own dyeing, printing and finishing and feature standard lines of merchandise can grade their production very readily through the use of AATCC standards and testing methods. As long as their production conforms with the standards they have established for each line, this work does not have to be repeated from lot-to-lot and only occasional check tests will be required for control purposes. The fastness ratings of dyestuffs which are supplied by the color houses cannot be used for rating color permanence of merchandise. The dyestuff ratings are laboratory evaluations derived from tests run under more or less ideal conditions. They are made on individual colors and do not take into account the effects of admixtures of other dyestuffs used to obtain a desired shade; nor do they embrace all the variables which are encountered in practice due to their application for special effects on novel weaves, combinations of fibers or unique application methods and apparatus. It rarely happens that a poor dyestuff can be rendered fast through particularly skillful application but it is not unusual for a dyestuff which is classed as a fast color to give very disappointing results when it has not been handled advantageously.

The commission dyer and printer are confronted with a more difficult task because they are frequently called upon to produce shades and effects on short notice and unless they find it possible to use a process which was previously worked out and on which they have the required factual data, they will not be able to certify the color permanence and finish characteristics without the use of special tests. This will slow down and complicate short orders but it may well be that the majority of these will be in the commercial color class where no high fastness ratings are required.

As I visualize the labeling plan it will be necessary for the dyer and finisher to certify on each lot the prescribed facts regarding color and finish. Since they will be responsible for the accuracy of this information and will wish to protect themselves against unjust claims due to upgrading of their merchandise on its route to the retail counter, a permanent identification suggests itself, such as, edge marking or stenciling through the utilization of a simple code which will be described later on. This involves an added operation, the cost of which will be resisted, but if all shops follow the practice the cost will be taken out of competition and will be passed on to the ultimate consumer. An exemption may be ruled for so-called commercial colors where no claim is made for quality of dye or finish. These fabrics will be sold unmarked with respect to legal ratings. Naturally, they cannot bear any house labels which claim or imply color durability, etc.

THE GARMENT MANUFACTURER'S POINT OF VIEW

It has been customary for garment manufacturers to sew in house brand labels which are decorative and have an advertising value. This should be continued but any quality claims they contain must conform with the new regulations. There is no place on the average garment for a large label containing a lot of technical information and it has been the custom to incorporate sales propaganda and handling instructions on loose string tickets, pin tags or leaflets, which undoubtedly serve a good purpose as far as they go. Unfortunately, they are immediately removed when the material or garment is placed in service and the benefits of the information they contain are lost. I doubt very much that many housewives keep laundering instructions which are usually of a highly specialized nature for future reference the lack of observance of which leads to needless destruction. Similarly, information concerning color fastness and special finishes is lost and forgotten when dissatisfaction begins to manifest itself after a season's wear. This leads to mistakes on the part of the consumer and to unfounded claims which harass the retailer and eventually find their way back to the manufacturer. In my opinion a permanent label should be devised which will contain all pertinent information in the form of a simple letter and numeral code which can be attached to each garment and will serve the purpose at a minimum cost. I wish to present this suggestion in its most elementary aspect for the consideration of all the trades involved with labeling. I have in mind a very simple strip of tape which can be sewed on each garment inconspicuously and which will remain there throughout its service life. One letter, such as "C," "W," "R" or "S" will designate the fiber, namely, cotton, wool, rayon, silk. Two letters will designate mixtures of these fibers. There will follow four or five numerals to define respectively the fastness to light, washing, chlorine, shrinkage and the character of the finish. The numerals can be taken from the AATCC ratings where available but others can be set up should a different scheme be considered more ap-

propriate. An explanatory code manual will be required. In its simplest form this need not be more than a card or small folder which will itemize the various coded features which I have listed and will define the meaning of the code numerals. It should not be difficult to describe the various classifications of light fastness in terms of service expectation and suitability. These code leaflets can be distributed by the department stores and if they carry the store's name no objection will be raised because of the small cost involved.

As a supplement a more elaborate code book will be required which can be gotten up through the co-operation of the various interests concerned with informative labeling; in other words a real task committee representing the entire industry from the manufacturer to the ultimate consumer. This code manual will describe the fibers and fastness classifications in greater detail and will contain washing, dry cleaning and other instructions pertinent to each group. This will be of inestimable value to manufacturers, buyers, consumers, laundrymen and dry cleaners.

A simple example of what can be accomplished by this plan would be the proper dry cleaning of durable and non-durable waterproofed garments. At present the dry cleaner seldom knows whether a garment has been waterproofed or by what process. The code will reveal this and he will know whether the finish must be restored and he can at once suggest this to the customer. On the other hand, if the garment contains a durable water repellent he will know that a special final rinse in clear Stoddard Solvent will be required to restore its efficiency. If this is explained to the customer at once the necessity for the extra small charge will be understood and in the majority of cases the customer will gladly pay it in return for the ensuing result. Similarly laundries will be in a position to wash garments with a definite knowledge of the most appropriate treatment and the elimination of mishaps. Even home laundering will proceed on a more efficient basis and unjust claims will be eliminated because it is a comparatively simple matter to determine whether the prescribed washing method has been followed.

The preparation and publication of our code book need not be planned on a profit basis; on the other hand it can certainly be devised so as to be self-sustaining.

THE DYESTUFF MANUFACTURER'S ATTITUDE

I have mentioned the fact that the fastness ratings supplied by dyestuff manufacturers concerning the many hundreds of dyestuffs which they produce serve only as a guide to the processing industries in planning their production. They constitute the ground work for subsequent factual labeling but because of the many variables encountered in practical application of dyes the ultimate quality of the finished article can only be certified through practical tests on the fabric itself.

The dyestuff manufacturers take a neutral stand on labeling. Generally speaking, it is immaterial to them which classes of dyestuffs their customers purchase and they adjust their manufacturing schedules according to the market's requirements. Naturally the industry would favor the use of the better colors which assure increased consumer satisfaction—and a tremendous amount of research on new fast colors and improved, simplified and foolproof dyeing methods and associated apparatus is being carried out, from which the entire industry and the public will benefit. In the last analysis, however, the dyestuff industry can only point the way to higher quality levels and offer its assistance and it has never attempted to coerce consumers into purchasing anything that they did not want. The motivation for informative labeling in the sense that it might lead to more expensive colors and finishes did not stem from this industry but as mentioned before originated with consumer and retail interests. As we see it there will always be a market for cheap, bulk colors and we will continue to supply them as long as they are wanted. We will be glad to concentrate our efforts in other directions to keep pace with changed market requirements as they manifest themselves.

THE CLEANING INDUSTRY'S POINT OF VIEW

The coded label and explanatory code book which I have described should be of great value to the laundrymen and the dry cleaners. As an industry they will probably benefit more from the factual description of the garments sent to them for processing than any other. We can dismiss their problem with the simple statement that the forehand knowledge of the composition of the material and of the durability of color and finish solves what is today, in many cases, a riddle of how to handle it in order to return it to its owner renovated without damage.

GOVERNMENTAL CONTROL AGENCIES

We feel that government agencies which now or later on will be concerned with textile labeling should rely on the AATCC for all the required data on standards and testing methods pertaining to color fastness and special finishes which involve wet processing. The interpretation of these standards and testing methods in terms of ultimate service to the consumer should be the subject of conferences between government agencies and trade associations with which the AATCC is prepared to co-operate in an advisory capacity. The industry should be permitted to set up its own quality standards, to adopt suitable testing methods and agree on acceptable label terminology. Considerable progress in this direction has been made. The main stumbling block and point of disagreement has been the question of declarations regarding expected service and garment life with their implied service warranties. If this requirement is driven too far a democratic plan for factual labeling will never be achieved. The government will either formulate its own system which will be a tough one if organized consumer interests have a big hand in it or the whole project will be dropped. An endless filibuster of talk to cross purposes could bring this about unless the Government decides to force the issue. An impassé can be avoided by using the suggested code ratings and explaining their significance in carefully worded text in the code manual. I foresee nothing but claims if brief service warranties are put directly on each label.

THE POINT OF VIEW OF THE AATCC

I think it would be well to quote a general news release which was issued by our Association in December, 1943, in consequence of a resolution adopted by our Council—

"The American Association of Textile Chemists and Colorists has been asked on many occasions by textile interests, and others, regarding its attitude toward informative labeling of textile materials, as well as governmental regulations and impending legislation on this subject which have been under discussion for some time. The AATCC comprises the technical personnel of the textile and dyestuff industries and, as such, it is equipped to develop factual information on the quality and durability features of all fabrics. The scientific data covering this very broad subject which has been accumulated by its research committees over a period of twenty-two years constitutes the basis of the quality standards of the textile industry and is freely available to allied industries, consumer organizations and the government agencies for any purposes for which it may be required.

"The AATCC takes a neutral stand with respect to informative labeling, whether voluntary or compulsory. It will supply the necessary standards and testing methods and other factual data but does not concern itself with the commercial or political aspects of this subject. Hence, the Association performs a very definite service to the industry,

the public, as well as the government, because it is the source of the facts that make accurate labeling possible and protect all parties concerned against unreasonable demands and regulations."

In my opinion, after considering many discussions of the subject, pro and con, our Association should continue to remain aloof from the merchandising aspects and the government control features of the proposed labeling plan. The question is often asked whether the standards we have established and our system of quality rating are suitable for the text of informative labeling, because they are not couched in the terminology required by the utlimate consumer and do not provide information on service suitability or expectations. In my opinion our Association should not meddle with these interpretations, which are out of our sphere of scientific fact-finding. We are prepared to assist other groups which are more closely affiliated with merchandising and consumer contact by participating in their conferences in an advisory capacity. Service terms and service predictions are warranties which are binding on the declarer, namely, the manufacturer, and involve merchandising groups, the ultimate consumer and eventually government regulating agencies. We have no place in this set-up except to supply fundamental scientific data, but we will assist in its correct interpretation should we be called upon to do so. If it is established at any time that one of our tests does not adequately portray the service expected of a given line of material, our Executive Research Committee will authorize a complete investigation and existing committees or new committees, as the case may be, will be charged with the study of the subject and authorized to recommend suitable changes. The present re-surveying of our standards and testing methods for wash fastness of cotton and rayon illustrates this point very clearly. However, the laundry tests which are now being run on a nation wide scale do not take into account fabric shrinkage. If it becomes an accepted doctrine that color behavior and garment shrinkage are integral and inseparable features of washability a baffling situation confronts us. I adhere to the premise that scientific evaluations of wash fastness must rate color deterioration and fabric shrinkage as individual factors. For the purpose of consumer labeling both features can be combined.

In closing I voice the hope that through clear thinking, co-operation between the several interests involved in informative labeling and mutual trust in each other's good intentions, the best results will be achieved when the time arrives for an active reopening of this labeling question.

MEETING, RHODE ISLAND SECTION

THE April meeting of the Rhode Island Section was held on the 27th in the hall of the Providence Engineering Society. Chairman Sturtevant called for order at 8:10 P.M.

As this was the last meeting of the season, reports of various officers and committees were read and approved. The committee for the Intersectional Contest has been organized with Earle D. McLeod as chairman. A nominating committee suggested that the future elections of local officers be held in December (or the last meeting in the Fall). This was put in the form of a motion, discussed and carried. It was further suggested that the present officers continue their duties until the next election, with the addition of James Shore as assistant secretary. This was also approved.

The speakers of the evening were: Arthur McLean, Director of Application Laboratory, Aridye Corp., Fairlawn, N. J., whose subject "Pigment Printing and Dyeing: Past, Present and Future" spoke of the advantages and disadvantages of pigment-resin dyeing and printing processes and of the developments possible in the fabrics of tomorrow. Wallace P. Heintz, Organic Chemicals Dept., E. I. duPont de Nemours & Co., Inc., told about "New Lubricants for Oiling and Wet Finishing Woolens and Worsteds," these being synthetic materials which have detergent as well as lubricating properties so that often the soap and alkali could be dispensed with during subsequent scouring.

The two hundred persons present gave a rising vote of thanks to the speakers at 9:45 P.M. after which the meeting adjourned.

Respectfully submitted,
R. W. Joerger, *Secretary.*

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ANNUAL MEETING, MID-WEST SECTION

THE annual meeting of the Mid-west Section was held at the Bismarck Hotel, Chicago, Illinois, May 5, 1945.

The afternoon meeting was called to order at 2:20 p.m. and 101 members and guests were present.

Dr. Powers of Monsanto was scheduled to speak on "New Developments in Textile Finishing" but was unable to be with us. In his absence E. Seigrist of Holeproof Hosiery Company addressed the meeting on shrinkage control measures as applied to wool hosiery, illustrating his remarks with displays of the following:

1—Chlorination process using hpyo.
2—Dry chlorination using chlorine gas in vacuum.
3—Enzyme treatment.
4—Melamine formaldehyde resin.

The display illustrated the untreated and treated after 10 home launderings in each instance. A lively discussion followed and the talk was well received.

Herman Boxser of Western Felt Works was the second speaker of the afternoon and delivered an excellent discourse on the use of various types of resin in the felt field. Mr. Boxser's experience in the field of resins well qualified his remarks in a very enlightening discussion of melamine and urea formaldehyde as well as other types of resins for shrinkage control. He brought out the fact that resins have been used more or less for the past ten years and their future is unquestionably brighter today. A discussion followed and his remarks were received with much interest.

INFORMATION FORUM

Panel of experts were as follows:

Joseph Jones, Charles Lennox, Carl E. Bick, George Chabot.

Questions sent in were as follows:

1. *What characteristics do nylon and acetate rayon possess, that make these two fabrics have a mutual attraction for practically the same dyestuff?*
2. *Are acid colors practical in dyeing Nylon?*

Answered by G. B. Chabot.

Mr. Chabot had no information regarding the first part of the question dealing with possible similar characteristics of acetate and nylon. He stated that a considerable amount of laboratory work had been done on dyeing nylon with acid colors which indicated very good possibilities by using selected dyes. In most cases best results for level dyeing exhaustion and fastness to washing and light were obtained by dyeing at the boil with 4 per cent formic acid on some colors and 10 per cent ammonium chloride on others. Mr. Hultberg raised the question of barre effect and it was stated by Mr. Chabot that on the type of nylon piece goods used in the laboratory experiments this condition was not encountered.

3—*We have been having trouble with mercerized cotton yarn in skeins. Please advise best known formula for mercerizing cotton yarn in skeins?*

Answered by A. Roy.

The usual procedure in skein mercerizing is to give the yarn a thorough wetting out, preferably by kier boiling, then extract the yarn to the point that you have a uniform moisture content. In a good many plants today, they have eliminated the kier boiling and have been using a good penetrator right in the mercerizing machine and drop the stretched yarn into the caustic solution. Load the machine

according to the manufacturers directions and apply the stretch according to the yarn.

Have the caustic from 50 to 60 deg. Tw., kept as cool as possible, about 20 deg. C. Immerse the yarn for 3 or 4 minutes. The time of immersion is of little consequence, as long as the yarn is thoroughly saturated. The yarn is under tension when it enters the mercerizing bath. Raise and wring out excess caustic. Wash while still under tension for at least 5 min. starting with hot water. Extra stretch is put in shortly after washing has begun, in order to take up the slack and help the luster. After most of the caustic is removed, release the tension and transfer the yarn to a sulfuric acid sour bath of 2 or 3 deg. Tw. and after 10 or 20 min. wash thoroughly and finish as desired.

4—Can acetate hosiery be dyed without pre-boarding?

Answered by Carl Bick.

It is now common practice in a number of mills to dye their acetate hosiery without pre-boarding.

The type of equipment used is important. It is generally agreed that the paddle wheel type of dyeing machine is best suited for this work. However, a number of mills are using rotary equipment with apparent success.

If a water soluble size is used in the throwing of the yarn, the goods should be scoured and dyed in one bath. If the size is too difficult to be removed in this bath, it will be necessary to scour the goods first but in either case the goods should be entered dry at the maximum temperature that will be used during the operation.

The dyeing medium used should be a neutral product having good sudsing properties. A "dead" bath should be avoided because the hosiery must be more or less buoyed to prevent creasing.

Temperature should not be elevated more than necessary. On paddle wheel type equipment, the temperature should not exceed 170 deg. F. When using rotary equipment, 160 deg. F. should suffice.

All other methods generally in use for the handling of acetate to prevent creasing should be maintained.

5—We have heard rumors that certain mills are dyeing acetate hosiery at high temperatures by previously converting the acetate. Is this true? If so, can you tell us how it is done?

Answered by Carl Bick.

We know of no instance where acetate is being converted in the hosiery industry as a regular procedure unless it is being done in the fancy hose business at times to eliminate certain pattern effects.

It is true that stockings made of acetate yarn have been made and placed on the market after being converted, but this was done only as an experiment. The results of the experiment, to the best of our knowledge, were very encouraging and received excellent consumer reaction. However, since it was considerably more expensive to make this type of merchandise and because no increase in price could be obtained because of OPA regulations, the experimentation was dropped.

When the acetate hosiery was converted by the use of certain salts, a very interesting phenomena results in a much sheerer, finer, better fitting fabric with better wearing qualities when dry. Experiments made with salts such as trisodium phosphate, sodium sulfate and sodium chloride produced similar results when used in varying concentrations. If the conversion is obtained by the use of a caustic alkali, the results are not satisfactory.

As an example, when acetate is converted by the use of trisodium phosphate in the proper concentration, a 75 denier stocking will be reduced to about 55 denier. The shrinkage causes the fabric to have more stitches and wales per inch, giving the appearance of having been manufactured on finer gauge equipment.

An example follows as well as microphotographs showing the difference between the two fabrics before and after conversion: *(See photos below.)*

Example:

PROCESS CONTROL

Temperature range: 110 deg. F. to 212 deg. F. Conversion takes place at 110 deg. F. but best results are obtained at 170 deg. F. to 212 deg. F.

$Na_3PO_4 12H_2O$ Range: 150 per cent to 200 per cent based on weight of goods.

Liquor ratio 20/1.

Best results are obtained with 200 per cent. Below 150 per cent only partial conversion takes place as well as some delustering of the fabric causing milky blotches and uneven dyeing.

PROCESS EXAMPLE

75 denier Cellulose Acetate Hosiery, 25 turns bright yarn, knit 45 gauge, 46 courses per inch was run at 170 deg. F. to 212 deg. F. with 200 per cent $Na_3PO_4 12H_2O$ for 60 minutes at the boil. Then rinsed and dyed at the boil with direct colors.

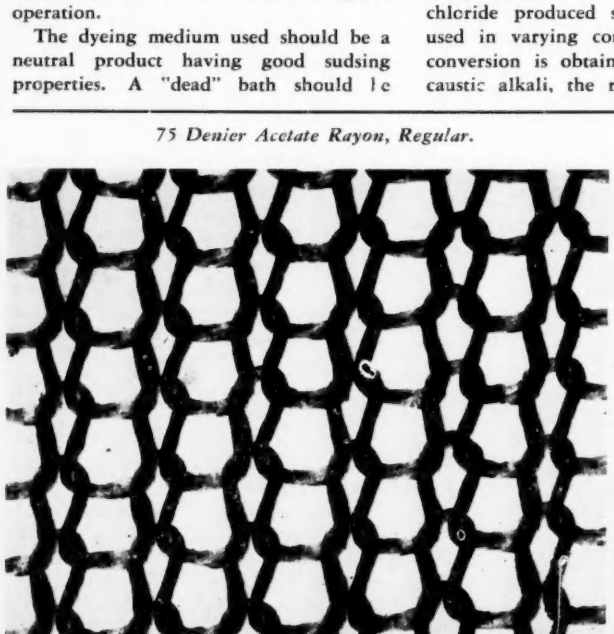
Results: *(See table, next page.)*

Any questions pertaining to this experiment will be gladly answered by me if I am able to do so.

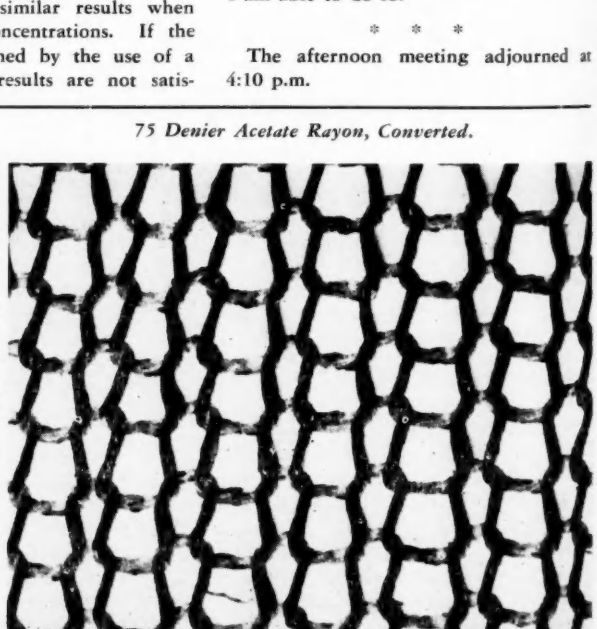
* * *

The afternoon meeting adjourned at 4:10 p.m.

75 Denier Acetate Rayon, Regular.



75 Denier Acetate Rayon, Converted.



	Regular Acetate	Cellulose Hosiery	Converted Hosiery	Per Cent Difference
Denier		75	55	23.33%
Length Overall		30"	27¼"	9% shrinkage
Finished courses per inch		44	48	9%

MULLENS TEST

Bursting Strength per Square Inch

Regular	Converted	Per Cent Difference
Low 31# High 39# Average 100 breaks 25.83#	Low 34# High 40# Average 100 breaks 37.49#	4.6%

Note: On basis of the bursting strength per square inch of regular 75 denier, cellulose acetate. Average 35.83#.

55 Denier break would be	26.23#
55 Denier converted acetate was	37.49#
Showing a gain in dry strength of	42.9%

Dinner was served at 7:30 p.m. and 105 members and guests were present. The minutes of the previous meeting and the Treasurer's report were accepted as read.

Mr. Hartquist stated that the National Meeting will be held in 1946.

Mr. Hartquist read a report from the Chairman of the Corporate Membership Drive.

Report of the Rumpus Committee headed by Al. Ray follows:

Suggestion 1

Elimination of evening speaker. This part of program being moved to afternoon session. "Carried."

Suggestion 2

Replace evening speaker with entertainment—also include, that at least once a year we have local talent to put on another show. "Carried."

Suggestion 3

That new members, if their application has been accepted, should be introduced to the members at their first meeting. Also that buttons with your name on be worn during our meetings. "Carried."

Suggestions made in the past should be carried out and enforced, namely No. 1 and No. 5 that were voted and passed at our February 12, 1944 meeting.

Nominating Committee, composed of L. C. Voss, Jack Moertel, W. E. Brainerd, Fred Davis and Harold Bragg reported as follows:

Officers

Chairman	Al. J. Feit
Vice Chairman	George E. Osha
Treasurer	Jos. H. Jones
Secretary	George B. Chabot, Jr.

Sectional Committee

Ed. J. Siegrist
Herman Boxser
A. G. Alexander
V. T. Hartquist

Councilors

Arthur T. Brainerd
Herbert W. Tetzlaff

S. Klein made a motion nominations be closed. "Carried."

E. Smith asked the Secretary to cast one ballot. "Carried."

New Business—1945 Outing.

S. Klein moved to have an outing if it comes within ODT regulations. This was seconded by A. Brainerd and carried. Date, June 23, 1945.

Meeting adjourned 10:00 p.m.

Respectfully submitted,
GEORGE B. CHABOT, JR.
Secretary.

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ONE HUNDRED AND FORTY-SECOND MEETING OF THE RESEARCH COMMITTEE

THE 142nd meeting of the Research Committee followed the Council meeting in Providence on Friday afternoon, March 23, 1945. Present were Chairman Louis A. Olney presiding, W. D. Appel, P. J. Ariente, K. H. Barnard, E. C. Bertolet, J. R. Bonnar, K. J. Broden, W. H. Cady, E. S. Chapin, W. W. Chase, H. Christison, R. F. Culver, M. A. Dahlen, J. N. Dalton, R. E. Derby, W. C. Durfee, H. E. Hager, H. M. Hartnett, H. F. Herrmann, A. E. Hirst, W. A. Holst, N. A. Johnson, R. W. Joerger, A. J. Kellner, P. J. Kennedy, H. V. King, D. P. Knowland, L. S. Little, F. J. McLeod, C. J. Monego, C. G. Morton, W. R. Moorhouse, A. D. Nute, C. L. Nutting, T. F. O'Brien, F. J. O'Neil, F. A. Prisley, R. Robertson, B. A. Ryberg, C. H. A. Schmitt, C. A. Seibert, T. R. Smith, J. A. Stevenson, H. W. Stiegler, H. B. Sturtevant, F. Tripp, F. R. Tripp, L. H. Turl, B. Verity, W. von Bergen, P. J. Wood and H. C. Chapin,

Mr. Little reported for the Executive Committee on Research. Mr. Seibert reported for the Wash Fastness Committee: Secretary.

Mr. Little reported for the Executive Committee on Research. Mr. Seibert reported for the Wash Fastness Committee; and in reporting for the Light Fastness Committee also, stated that the new standards would be ready for distribution at two dollars per set as soon as cards carrying directions could be printed. Mr. Bertolet reported for the Committee on Mildew Proofing. In further discussion, on water proofing, he emphasized the importance of first removing cotton waxes, and said that in construction of fabrics for this purpose there was a trend toward increase in the ratio of warp to filling, to produce better cover in proportion to weight. Mr. Ryberg reported further work on water repellency tests in Lowell, stating that time of wetting was more important in hydrostatic tests than had been realized. An advantage in our impact test, he stated, was that head could be increased without increase in volume of flow.

Mr. Knowland reported that the Committee on Transference of Color preferred Munsell grays to the present dyed standards of the Association, but liked still better a series of colored Munsell standards which he exhibited. Mr. Prisley reported for the Committee on Detergency. Representing the wool section of this committee, Mr. Nutting described work continuing in Lowell on a laboratory washer, with which the committee hoped to provide an experimental method rather than a universal standard test for detergents. Mr. Cady reported for the Committee on Standard Methods of Analysis, Mr. Barnard for the Committee on Ageing of Textiles, Mr. O'Neil for the Committee on Color, and Mr. Kellner for the Committee on Resistance to Insect Pests. Dr. Hager described intense public interest in flame proofing of brushed rayons, on a test for which his committee is working.

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary.*

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RECOMMENDATIONS OF THE SUB-COMMITTEE OF THE A.A.T.C.C. ON FLAMMABILITY OF CONSUMER TEXTILES

ON May 8th the Sub-committee of the American Association of Textile Chemists and Colorists on Flammability of Consumer Textiles held a meeting and offered the following recommendations to retailers as a stop gap until such time as a National law is passed.

This group has designed a machine for use in testing merchandise for fire hazard. This equipment will be ready for use as soon as a few minor changes are made, which will require approximately a week.

The test as tentatively set up by the Committee puts on the hazardous list any material which will ignite with a standard flame within a period of one second and flash over the surface of a sample measuring 1½" x 6", when held at an angle of 45°, in five seconds time. Short napped brushed rayons will pass this test successfully, but the longer naps do not.

The recommendations of the Committee are as follows:

1. Brushed Rayons—Wearing Apparel—Brushed rayons that will not pass the test as tentatively specified by this Committee should not be offered for sale unless they are treated with a fire retardent chemical, are so labeled and that the label states

definitely that the treatment must be renewed after washing and/or dry cleaning. It is recommended that all brushed rayon materials be submitted to a laboratory for check as to whether or not they will pass this test.

2. *Pyroxylene Coated Materials or Pyroxylene Films—Wearing Apparel*—The Committee was very definite in the opinion that pyroxylene coated materials or films should not be used for wearing apparel. It is our understanding that the Trade Association of Pyroxylene Coaters is also planning to take this stand. Pyroxylene coated shoes were discussed but it was decided that this subject should remain dormant for the time being. There is only one accident on record which may have been a freak. It is felt that due to the heaviness of the coating in shoe materials and the amount of pigment present that shoe materials are not too hazardous. The Committee further expressed the opinion that pyroxylene coated materials for show curtains, upholstery materials, etc., would be satisfactory for use.

3. *Toys of Brushed Rayon and Pyroxylene Coated Materials* — The Committee felt that toys made of these materials could be sold providing they were labeled "inflammable." The decision was based on the fact that should such articles catch on fire they could be disposed of easily and do not offer the difficulty of wearing apparel, where it is necessary for the person to rid himself of the garment.

These are the first suggestions of the Committee and other materials will undoubtedly be added to the list as time goes on.

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MEETING, NEW YORK SECTION

THE last regular meeting of the New York Section for the 1944-45 season was held on May 18th at the Downtown Athletic Club, New York City.

Reports from the secretary and treasurer were accepted.

Paul J. Luck presented his report as chairman of the Outing Survey Committee. He stated that the committee did not consider it feasible to hold an outing at this time. In response to the post card ballot regarding the possibility of holding an outing in the Fall, if condition warranted it, he reported that a total of 204 cards had been received, of which 174 were favorable and 30 unfavorable. The committee was requested to continue to act as an executive committee on planning for a possible future outing. Other members of the committee are Hugo H. Todebush and Timothy Gibson.

Commander Walter F. Prien reported as chairman of the Nominating Committee, presenting the following slate of officers for the 1945-46 season: *Chairman*—Emmett Driscoll, Turner Halsey Co.; *Vice-Chairman*—Dr. Herman E. Hager, General Dyestuff Corp.; *Secretary* — Norman A. Johnson, "American Dyestuff Reporter"; *Treasurer*—Paul J. Luck, Calco Chemical Division, American Cyanamid Co.; *Councilors* — Patrick J. Kennedy, E. I. duPont de Nemours & Co., Inc.; Commander Roy G. Buck, Bureau of Supplies and Accounts, U. S. Navy; Leonard S. Little, E. I. duPont de Nemours & Co., Inc.; Thomas F. O'Brien, R. W. Bates Piece Dye Works; George L. Baxter, Bradford Dyeing Association; *Sectional Committee* —Major Harold W. Stiegler, Chemical Warfare Service, U. S. Army; Ephraim Freedman, R. H. Macy Co.; Edward H. Schmidt, Shell Oil Co.; Frank Stutz, Better Fabrics Testing Bureau. These officers were unanimously elected.

The chairman reported that Commander Walter F. Prien, chairman of the Technical Program Committee and the Nominating Committee, had asked to be relieved of these duties due to pressure of business but would serve in an advisory capacity to the Intersectional Contest Committee.

The following nominating committee was appointed to present a candidate for the additional councilor to which this Section is entitled: Patrick J. Kennedy, Chairman; Robert E. O'Hara and Daniel P. Knowland. This committee will report at the first meeting to be held in the Fall.

Henry F. Herrmann, Chairman of the national Corporate Membership Committee, reported that dues from corporate memberships now amount to $38,000 per annum, against a goal which was set at $35,000. Efforts will be continued to increase the number of corporate members so as to establish a firm foundation for the present and future research program.

The technical program consisted of a symposium on "Correlation of Test Methods with Consumer End Uses." Speakers and their subjects were as follows: Henry F. Hermann, General Dyestuff Corp., "The A.A.T.C.C. Surveys the Informative Labeling of Textiles"; Dr. William E. Coughlin, Good Housekeeping Institute, "Meeting Consumer Needs in Textiles"; Herbert A. Ehrman, National Bureau of Standards, "The Importance of Standard Test Methods, Ratings and Terminology for Colorfastness."

The attendance was approximately 150.

Respectfully submitted.

Norman A. Johnson, *Secretary.*

Marquisette Nettings

(Concluded from Page P233)

is fitted into a one hole stopper, which in turn is placed in a 6 inch by 1 inch test tube. The whole apparatus is then placed in an oven or water bath and heated to 100 plus or minus 2 degrees F. (approximately 38 plus or minus one degree C.) for two hours. The specimen is then dried out of contact with the bleed piece by pressing between white cloth with a moderately hot iron (275 to 300° F.). The change in color and staining of the white material are considered in rating the fastness to water.

Water Repellency. A 6" x 6" swatch is conditioned at 65 per cent R.H. and 70° F., then weighed. The sample is then immersed in distilled water at 80° F. for 20 minutes with suitable weights attached to the lower edge so that the upper horizontal edge is 3 inches under the surface of the water. After the 20 minute immersion, remove the sample and place between blotting papers and pass through a wringer. Weigh sample. The water absorption shall not be greater than 35 per cent.

The blotting paper used in the above test shall be 24 x 38 — 240 basic paper and shall have a maximum absorption time of 50 seconds when tested in accordance with paragraph 13, Federal Specification UU-P-31, Paper, General Specification, and a thickness of approximately 26 points when measured in accordance with paragraph 11 of that specification. The bursting strength shall be not less than 35 points on the Mullen tester.

Leaching Test—A sample of the netting, measuring 6 x 12 inches, is leached in water 65° F. for 24 hours. The flow of water is so controlled that the sample is subjected to a leaching action of 3 gallons of water over a period of 24 hours. After leaching the sample of netting is inoculated for the accelerated mildew test.

Accelerated Mildew Test—Samples of the netting, 5 strips 1 x 3 in. after leaching, as above, and one sample (strip) unleached are placed in separate Petri dishes (one strip to a dish) and are placed on an agar medium. The samples are then inoculated with *Chaetomium Globosum* and incubated for a period of two weeks. On examination, if no growth of mildew is visible on the leached and unleached samples, the netting is considered satisfactory.

In concluding, I would like to add that the cellulose finish can be applied on the conventional type equipment available in the ordinary finishing plant and this feature, coupled with the fact that, when properly applied, it meets the performance requirements of "Netting, Cotton, Insect, Marquisette" and explains to a large extent why over 90 per cent of the finishing plants are using the cellulose finish on netting.

TRADE NOTES • NEW PRODUCTS

• JOINS VIRGINIA SMELTING

J. Bracken Johnson, until recently Research Chemist for the New Bedford Rayon Company, has joined the Industrial Sales staff of the Virginia Smelting Company, Manufacturers of Textile Chemicals, West Norfolk, Virginia. Mr. Johnson's activities will be directed toward technical sales and development work among the textile mills of the South.

J. Bracken Johnson

• OFFICERS RE-ELECTED, S & R P & D A

The following officers of the Silk & Rayon Printers & Dyers Association of America, Inc., were re-elected at a recent meeting of the board of directors: *President*—Joseph Seyer, Sr., Seyer Dyeing & Finishing Co.; *Vice-Presidents* — Dean Lewis, Colonial Piece Dye Works and Samuel Brenner, E. & W. Dyeing Corp.; *Treasurer* — William Peltzer, Puritan Piece Dye Works; *Secretary* — Dr. Rocco Nazarro, American Textile Processing Co. The following board members, whose terms recently expired, were re-elected: Alfred Bohny, Modern Central Silk Dyeing & Finishing Co., Dean Lewis, Felix Tagliabue, Palisades Piece Dye Works. The executive secretary of the association is Howard J. Fletcher.

• MONSANTO TRANSFER

Transfer of Henry V. Moss from the research laboratory of Monsanto Chemical Company at Carondelet, Missouri to Anniston, Alabama as supervisor of inorganic research, was announced recently by R. R. Cole, general manager of the Phosphate division. All research activities at Carondelet have been moved to Anniston to improve coordination of the two sections.

• MOISTURE CONTENT, WOOL YARN

American wool interests meeting recently in New York under the auspices of the American Standards Association registered their approval of an international undertaking to harmonize the standards for determining moisture content of wool yarn. This varies considerably according to the moisture content of the air, and since wool is bought and sold by weight in world markets, differences in the amount of water wool contains may affect its selling price. Under normal conditions wool contains anywhere from 8 to 18 per cent moisture. In Great Britain climatic conditions have caused standardization at 18¼ per cent. In America the standards developed through usage vary from 10 per cent to 13.6 per cent depending upon the type of wool yarn.

This step which would simplify the buying and selling of wool in world markets has been proposed by the Australian Standards Association to wool raising or buying countries of the world as a job to be undertaken by the recently organized United Nations Standards Coordinating Committee. Herbert J. Wollner, head of its New York office, stated that the Australians' proposal was being submitted to the national standardizing bodies of other countries as rapidly as possible and that future action of the United Nations Standards Committee would depend upon their reply. First step will be an interchange of information among the various countries as to national usage.

American industrial groups represented at the meeting were:

American Association of Textile Chemists and Colorists
American Society for Testing Materials
American Wool Council
Boston Wool Trade Association
Hand Knitting Yarns Industry
National Association of Hosiery Manufacturers.
National Bureau of Standards
National Retail Dry Goods Association
National Association of Wool Manufacturers

The Office of Marketing Services, Wool Division, War Food Administration; and the Federal Trade Commission attended as observers.

• HERCULES APPOINTMENTS

Two new appointments in Hercules Powder Company's Research Department were announced recently by Dr. Emil Ott, director of research for the company.

The appointments were: Dr. Robert W. Cairns, to be assistant director of research and Dr. Raymond F. Schultz, named director of the company's Experiment Station.

• du PONT TRANSFERS

Ki Williams, plant manager of the acetate rayon plant at Waynesboro, Va., for the last four years, is being transferred to Wilmington as assistant to A. W. Frame, director of acetate rayon production, it was announced recently by E. I. du Pont de Nemours & Company. W. T. Wood, plant manager on special assignment in the Nylon Division, succeeds Mr. Williams at Waynesboro. The changes become effective at once.

• TO SOLICIT WAR BOND PURCHASES

Again, with the inception of the Seventh War Loan, Stanford L. Hermann, Operating Vice-President of the Apex Chemical Company, Inc., has been loaned to the Chemical Industry Committee of New York headed by H. R. Salisbury, of the Air Reduction Company, for the purpose of contacting representative members of the Chemical Industry to solicit War Bond purchases, as he had previously in both the Fifth and Sixth War Loan Drives.

Mr. Hermann not only is a member of the New York War Finance Committee, but also solicits purchases for the War Finance Committee of Union County, New Jersey, where he resides.

• JOINS WALDRICH

Robert C. Allison, formerly chief chemist for Alexander Smith & Sons Carpet Company and for the past few years in charge of their chemical research, has left that organization to become affiliated with the Waldrich Company.

Mr. Allison will work directly under Oscar R. Flynn, who has been Head Chemist of the Waldrich Company for many years.

• PHILADELPHIA ALUMNI, PHI PSI

The Philadelphia Alumni of the Phi Psi Fraternity has been reactivated. Officers, to hold office for a year, are: Thomas H. Hart, Hart Products Corp., President; Paul C. Beatty, American Viscose Corp., Vice-President; Bernard R. Koenig, Philadelphia Textile Institute, Secretary; John R. Kiem, American Viscose Corp., Treasurer.

The first meeting, held on May 11, consisted of formal business and the installation of Alpha Active Chapter officers for the coming year. They are as follows:

C. C. Baxter, President
J. Moran, Vice-President
R. Riboul, Secretary
J. Donegan, Treasurer
J. Pitt, Senior Warden

L. Borel, Junior Warden
L. Clelland, Corresponding Secretary

Plans for other meetings are already under way. Phi Psi members in the Philadelphia area are requested to get in touch with the secretary of the Alumni group as soon as possible.

• PRESIDENT, COST ACCOUNTANTS

Robert R. Hertzler, Controller of the Forstmann Woolen Co. in Passaic, N. J. was elected President of the New York Chapter of the National Association of Cost Accountants at its regular meeting held Monday, May 28, 1945, at the Hotel New Yorker, in New York City.

• WILL CONDUCT PATCH TESTS

Robert R. Schwartz, M.D., 2426 Grand Ave., Bronx 53, N. Y., announces the availability of facilities for conducting patch tests and other dermatological research. The purpose of these tests is to determine the effect of materials such as fabrics, coatings, dyes, soaps, cosmetics, etc. on human skin. A group of 600 normal individuals is available for dermatological research. Any part or the entire group may be utilized. Dr. Schwartz states that the investigations are conducted according to the recommendations of the Dermatoses Section of the U. S. Public Health Service.

• MEETING, S.O.C.M.A.

The next meeting of the Synthetic Organic Chemical Manufacturers Association will be held on Wednesday, June 13th, at the Hotel Commodore, New York City, at 12:30 P.M.

• STEIN, HALL APPOINTMENTS

Stein, Hall & Co., Inc., New York, manufacturers and distributors of starches, dextrines, dry and liquid adhesives and other materials used by many industries, and importers of burlap and other commodities, has announced the appointment of Robert Rau as assistant treasurer, J. M. Horine as auditor, and Frank R. Bauer as manager of the accounting department.

A. M. Doremus, who joined the company in 1926 and has been office manager since 1931, has resigned, effective June 1st, to become a partner in a mountain resort at Sheltered Lakes, Dresden, N. Y., in Adirondack State Park.

• OPEN FORUM •

59—We understand that there is a process of washing natural silk and perhaps other yarns by means of soap foam and that it has been found that this process was improved by controlling the size of the bubbles. We are desirous of learning more about this process, particularly as to its practicability and any criticisms which might be made of it.—*S & N*

A minimum of $2.00 will be paid for each reply to this question that is published.

• ABSTRACTS FROM CONTEMPORARY JOURNALS •

(Continued from Page 228)

nel of the ground-nut, which is the peanut or the monkey nut.

Spinnable solutions of the protein are made by employing dilute alkali as a solvent. In general a solution of 20-30 per cent concentration of protein is made in dilute alkalis so that the initial pH of the solution is at least 12.5. There is generally a maturing period before the solution reaches spinnable viscosity.

The solutions are extruded or spun in a manner similar to that of viscose rayon. The coagulating bath contains about 15 per cent sodium sulfate and about 1 per cent sulfuric acid. The temperature is 25-40° C. The issuing filaments are collected at a rate greater than the speed of extrusion thus effecting a stretching which probably realigns the molecules. The filaments are kept under tension for a period.

A hardening process is necessary. A simple and economical treatment was found to be the use of an aqueous solution of a highly soluble halide of an alkali, e.g. NaCl, containing a small concentration of a hydrogen halide, e.g. HCl, and a small concentration of formaldehyde. In order to eliminate the tendency of the fibers to stick together a substantially saturated solution of sodium chloride or other salt is used to prevent the fibers swelling. At the end of the treatment the fibers are washed and then adjusted to a pH of 8 so that they will dye evenly with wool.

Ardil is a cream colored, crimped fiber with a soft, wool-like handle. It has a soft luster. A peroxide bleach improves the color. The fiber is resilient and is more crease-resistant than cellulose fibers. Its tensile strength is 10 kg/mm.^{2} Its elongation at the break is 50-100 per cent. It attains a high degree of dimensional stability. Water absorption is of the same order as wool but rather higher. The hysteresis for Ardil is about the same as that of wool. It does not felt in the same manner as wool and fur but it does show another type of felting if molded and welded when held in contact under heat and pressure. Wear tests show that Ardil alone has poor resistance but does not reduce the wear of blends with other fibers to too great an extent.

An all-Ardil fabric and an Ardil-wool fabric give about the same thermal insulation as an all-wool fabric of the same thickness and structure. It is mothproof. Ardil has an affinity for dyestuffs normally used for dyeing protein fibers. It does not possess the same dyeing characteristics as either silk or wool but mid-way between the two. Its behavior toward acid dyestuffs most closely resembles that of chlorinated wool. In dyeing unions, perfect solids are not generally obtained, particularly with three-color mixtures, although in self shades results are generally satisfactory.

A number of mixed fabrics containing Ardil have been made on an experimental basis and are said to show considerable promise for future use. The work has been interrupted by the war and samples are not yet available but it is hoped that a pilot plant may be erected at an early date.

WOOL RESIST PROCESSES: THE USE OF FORMALDEHYDE AND ITS CONDENSATION PRODUCTS WITH NAPHTHOSULPHONIC ACIDS, C. H. Elliot. "Journal of the Society of Dyers and Colourists," page 273. No. 10, Vol. 60, October, 1944.

To obtain a good resist to acid dyes on wool, it has been previously shown that the process should block the basic side chains of wool and also introduce new acidic groups. The first requirement may be met by treatment with formaldehyde at above 100° C. This treatment reduces the affinity of wool to 0.1 N hydrochloric acid from 0.81 millequivalent per g. to 0.67-0.62 millequivalent per g. Formaldehyde combines firmly to the extent of 2.4-5.5 per cent and at the same time produces a moderate resist. A possible explanation of the reactions which occur have been advanced by the author as follows after a study of the elastic properties of human hair and its supercontraction in boiling sodium bisulfite solution:

"Reaction with basic groups occurs in boiling solutions, probably with formation of —NH—CH_2—NH— cross-linkages and consequent strengthening of the fibre. Since resistance to supercontraction in boiling sodium bisulphite solution is not observed, a sufficient number of stable cross-linkages have not been formed to prevent collapse of the structure. Similarly, a significant resist to acid dyes is not produced by boiling in acid formaldehyde solution, and it is necessary to submit the material to subsequent heat treatment. This increases slightly the extent of reaction with basic groups, but since a very consid-

erable increase in resistance to extension in 0.1 N hydrochloric acid results, many more cross-linkages must be formed at this stage, with consequent resistance to supercontraction in bisulphite. These cross-linkages may include, in addition to —NH—CH_2—NH—, —S—CH_2—S— and —S—CH_2—NH—, methylene bridges between peptide chains, and between amide groups. Reaction between amino-groups and formaldehyde to form these methylene bridges may be responsible for the improvement in resist effect which is caused by heat treatment, especially as cross-linkage formation has only a small influence in preventing swelling of fibers in acid solutions."

Inclusion of a naphthol sulfonic acid in the formaldehyde solution used meets the second resist requirement—the introduction of new acidic groups and enhances greatly the effectiveness of the resist treatment.

β-naphthol-6:8-disodium sulfonate (G salt) which couples with diazo compounds with difficulty, failed to be effective. β-naphthol-3:6-disodium sulfonate (R salt) was found to be most effective. It is possible that the mechanism of condensation between naphthol sulfonic acid, formaldehyde and wool is closely related to the mechanism of the coupling reaction.

Best results for this process are obtained in the following manner:

Wool is boiled, in any form, for 30 minutes with 10 vol. of solution containing 10 per cent (weight/vol.) of formaldehyde, 0.5 per cent (vol./vol.) of sulfuric acid and 2-3 per cent of R salt. The material is then centrifuged and dried quickly below 100° C. before being baked for about 15 minutes at approximately 110° C. Care should be taken to avoid local overheating. It is then washed thoroughly in water. Slight discoloration may arise if the material is stored in an unscoured condition. Accordingly it should be scoured after treatment. Scouring does not materially harm the effectiveness of the resist.

The scoured treated material has a full handle and good color. If the material is treated without R salt, a moderate resist is produced which will be useful for the production of tone-in-tone effects. Although treatments at 110° C. reduces the strength of wool yarns it does not alter the resistance to wear of wool cloth.

THE PRODUCTION OF RAYON FROM ALGINIC ACID, J. B. Speakman and N. H. Chamberlain, "Journal of the Society of Dyers and Colourists," page 264, No. 10, Vol. 60, October, 1944.

The source of alginic acid is seaweed. Seaweed itself has already been used as a raw material for the manufacture of rayon. The fibers obtained consist mainly of alginic acid and protein in variable quantities. The rayon is so variable in its properties as to be of little commercial value.

The alginic acid obtained from seaweed is usually available in the form of sodium alginate which is commercially marketed. The mechanical principles of viscose rayon manufacture were used in producing yarns from sodium alginate. The first yarns obtained were of little use for the textile industry as they had little strength, and were harsh and straw-like due to filament adhesion. Further experimentation eliminated these troubles.

Rayon of satisfactory appearance, handle and strength was obtained by extruding a solution of sodium alginate into a coagulating bath containing calcium chloride (N), hydrochloric acid (0.02N) and 2.5 per cent by vol. of olive oil emulsified with an auxiliary agent. The grade (mol. wt.) of sodium alginate used is of little consequence but the concentration must be high, the best handle being given by a solution containing 7.5-8.0 g. of the dry alginate per 100 g. For convenience in spinning, the grade of the alginate should be so chosen that the solution has a viscosity of 100-150 sec. at 25° C., as determined by the falling sphere viscometer, using 5/32 in. steel balls. Yarn with a strength of 2.0 g. per denier at 64.8 per cent R.H., in deniers as low as 2 denier per filament has been produced.

The calcium alginate rayon, as prepared above, is dissolved by dilute alkalis. Other alginates, such as chromium and beryllium, are alkali-resistant. However, the alkali-resistant rayons are difficult to prepare by direct spinning of the sodium alginate solution into coagulating baths containing salts of chromium and beryllium. They can be obtained from the calcium alginate rayon by treatment with the basic acetates of chromium and beryllium. If desired, the calcium may be removed by a previous treatment with 0.5N hydrochloric acid in the cold. The conversion may be also made in the fabric form.

Alkali resistant rayon may also be made by extruding sodium alginate solution into a bath containing sulfuric acid (N) saturated with sodium sulfate, and 2.5 per cent by vol. of olive oil emulsified with an auxiliary agent. The alginic acid, in yarn or fabric form, can then be made alkali-resistant by treatment with a solution of basic chromium acetate or basic beryllium acetate.

SOME PROPERTIES OF ALGINATE RAYONS, N. H. Chamberlain, A. Johnson, and J. B. Speakman, "Journal of the Society of Dyers and Colourists," page 13, No. 1, Vol. 61, January, 1945.

The physical properties of representative types of alginate rayon were examined in order to define the scope of their utility as textile materials. All the alginates are highly hygroscopic, and there is considerable hysteresis between the adsorption and desorption isotherms of calcium, aluminum, chromium and beryllium alginates at 25° C. In the case of calcium and barium alginates, the water adsorption capacity at 65 per cent R. H. and 22.2° C. increases with increasing metal content, after a slight initial drop, and so does the absolute strength of the yarns. But their denier also increases with increasing metal content, and when the breaking load is expressed as g. per denier, it is found that maximum tenacity is given by calcium and barium contents of 0.10 and 0.06 g.-atom per 100 g. aliginic acid, respectively. Restriction of the metal content to these values has the further advantage of preventing excessive water adsorption.

Because of their high metal content, the alginate rayons have rather high densities, extreme values for the dry samples examined being 1.735 for a calcium-beryllium alginate and 1.780 for a calcium-chromium alginate. Although disadvantageous in raising the density, the high metal content of the alginates has the great merit of making them totally non-inflammable, and they should be specially suitable for the manufacture of curtains and furnishing fabrics.

Unlike calcium alginate rayon, which is soluble in a solution of soap (0.2 per cent) and soda ash (0.2 per cent), chromium and beryllium alginates are only slightly weakened by treatment with the solution for 30 min. at 25° C. or 40° C. Determinations of the load-extension curves of the rayons at 0 per cent, 65 per cent and 100 per cent R.H. and 25° C., however, show that the extensibility of chromium and beryllium alginates is much too low to permit their successful use in weaving and knitting. Calcium alginate rayon possesses satisfactory elastic properties for these purposes, and since it can be stored for long periods at ordinary humidities without deterioration, it seems likely that it will form the stock material for all purposes for conversion into woven and knitted fabrics, which can be made alkali-resistant by treatment with chromium or beryllium acetate in finishing, as well as for special uses in which its alkali-solubility is turned to practical advantage.

UNION DYEING, Fred Smith, "Journal of the Society of Dyers and Colourists," page 8, No. 1, Vol. 61, January, 1945.

The author points out that there are no fixed rules in union dyeing due to the various mixtures of fibers and types of materials.

Dark shades on an Unstripped Ground —(Wool and Cotton) There are two methods of approach. The first method is to dye the wool with either acid dyes, neutral

dyeing dyes, or according to the fastness desired, with chrome dyes. After washing well, the cotton is filled in cold or at a very low temperature. Any neutralizing must be very carefully done, and not completely if acid dyes have been used, otherwise part of the dye will be stripped and the pieces may develop unevenness. When using level dyeing acid dyes, the shade before burl dyeing with direct cotton dyes should be left a little lighter than when using fast acid dyes or chrome dyes, which are usually sufficiently fast to permit the use of a little free alkali, thus reducing the amount of cotton dye which goes on to the wool.

The second method is to use a direct dye that dyes wool and cotton in a boiling bath. Before dyeing, the goods are washed well and run for a short time in a bath containing about 5 per cent ammonium sulfate. The cotton takes up a fair quantity of dye by this method and it is brought up to shade by cooling down to 140° F. and adding a little ammonia. Some suitable dye that has more affinity for cotton than for wool and has the same shade as that of the dye used at the start is added together with some dye of a darker shade to make up for the darker ground of the wool.

A list of suitable dyestuffs are named.

Navy Blues—The following method is given for the production of navy blues.

"These are chiefly dyed on a dark grey or blue ground. The latter only requires filling in to the desired shade; the former is usually dyed with one of the bright acid violets shaded with Disulphine Blue and darkened, if necessary, with Acid Black 10B (Naphthol Blue Black). Faster dyes are used if required. After dyeing the wool, rinse well and burl dye the cotton for 1-1½ hour together with 10-15 per cent myrobolans in a cold short liquor, together with 1-2 per cent Chlorazol Black BH. Then, without running off the myrobolans liquor, add quickly 12 pints of "nitrate" of iron liquor (made by the action of nitric acid on copperas). If this is added too slowly most of the iron will be precipitated in the liquor without combining with the tannin in the cotton. In consequence the tannin will tend to wash off the cotton and give a thin shade instead of a well-covered one. . . .

"It is obvious if the ground shade is too dark to allow the desired shade to be obtained, the pieces must be stripped by a suitable method. Sulfuric acid, used either before or during dyeing may be sufficient. A bichromate and sulfuric acid strip is particularly suitable for browns; or one of the hydrosulphite compounds may be used . . ."

Control in Union Dyeing—A series of experimental dyeings were made under different conditions with four cloth mixtures as follows: No. 1, 80 per cent wool and 20 per cent cotton; No. 2, 50 per cent wool and 50 per cent cotton; No. 3, 33 1/3 per cent wool and 66 2/3 per cent cotton; No. 4, 20 per cent wool and 80 per cent cotton. In the first experiment the four mixtures (after scouring, rinsing and wetting-out) were entered in a dyebath containing 3 per cent Chlorazol Fast Red K (Colour Index 278) and 20 per cent Glauber's salt. The liquor goods ration was 30:1 and the pH of the dyebath was about 9 after entering the goods. The goods were entered at the boiling point and boiled for 45 minutes; the bath was not exhausted. Visual comparison of the dyeings showed that the wool was much heavier in shade than the cotton. The wool and cotton were the same shade in every case, i.e., the cotton and wool in mixture No. 1 resembled the cotton and wool in mixture No. 4.

In the second experiment 3 per cent of Chlorazol Fast Red K and 20 per cent Glauber's salt were again used. The bath was boiled for 45 minutes and then cooled to 140° F., 20 per cent common salt was added and dyeing was continued for 40 minutes more. When the dyeings were compared with those in the first experiment it was found that the wool was identical in shade but the cotton was 2½ times as heavy. The shades of the cotton and wool were independent of the percentages of fiber present.

In the third experiment 100 per cent cotton and wool fabrics were dyed separately, using 3 per cent Chlorazol Fast Red K and 20 per cent Glauber's salt, and after boiling for 45 minutes were cooled to 160° F. and 20 per cent common salt added. The shade of the wool was the same as that in mixtures 1 and 4 in experiments 1 and 2 whereas the cotton matched all the cotton mixtures in experiment 2.

In the fourth experiment a dyeing was carried out with the same amount of dye but using common salt instead of Glauber's salt, boiling for only 10 minutes instead of 45 and adding common salt after cooling down. After dyeing the wool and cotton were practically identical, the shade of the cotton being the same as in experiment 2.

In the fifth experiment mixtures containing 80 per cent wool cloth and 20 per cent cotton cloth were dyed at the boiling point for 45 minutes and then cooled to 140° F. using 3 per cent Chlorazol Fast Red K and 20 per cent Glauber's salt, and adding 20 per cent common salt after cooling to 140° F. An addition of 2 c.c. of Calsolene Oil HS (I.C.I.) was also made and this kept the dye off the wool to a considerable extent. A small pattern was cut off after boiling for 45 minutes. The shade of the cotton after cooling was identical with this pattern. The wool also gained during cooling and finished a little heavier in shade than the cotton, although it was only two-thirds as deep as in experiment 2.

In the sixth experiment wool and cotton were dyed separately in the loose state and then carded together to give mixtures of 80 per cent wool and 20 per cent cotton and 20 per cent wool and 80 per cent cotton. This showed that a mixture of 20 per cent wool and 80 per cent cotton gave a much lighter shade than a mixture containing 80 per cent wool and 20 per cent cotton. The shade varies with the composition.

In the seventh experiment the material (cotton and wool mix) was brought to a pH of 6.5 with ammonium sulfate and a little acetic acid, then rinsed and dyed at the boil for 45 minutes with 2 per cent Chlorazol Fast Red K and 20 per cent Glauber's salt. The dyebath was cooled to 160° F. and 20 per cent common salt was added together with 2 per cent Chlorazol Fast Red K in the case of the mixture containing 80 per cent cotton and 20 per cent wool, and 1 per cent Chlorazol Fast Red K in the case of the mixture containing 20 per cent cotton and 80 per cent wool. The cotton piece and the wool piece in each dyeing matched each other, although the wool was heavier in shade than the cotton, but owing to the lower pH value the wool in this case was equal to a 3 per cent dyeing at pH 9 and the cotton matched. It was concluded that with this dye the shade of the wool portion remains fairly constant and additions of dye to the cooling bath will vary according to the amount of cotton in each blend.

Cellulose Acetate Rayon and Wool—The cellulose acetate rayon is dyed first, using sufficient neutral dispersing agent of the sulfated alcohol type, together with a suitable highly sulfonated oil. Plenty of time should be allowed between 140° F. and 160° F. for the rayon to pick up the dye before raising to 190° F. The shade of the wool can be brought up by using neutral dyeing acid dyes or by adding 2-3 per cent formic acid, 10-20 per cent Glauber's salt and a level dyeing acid dye.

Sulfur dyes—These may be applied at 110° F. on loose wool and cotton waste when fast dyeings are desired for making colored and white checks. After dyeing the cotton first with sulfur dyes, the wool is dyed with either fast acid dyes or chrome dyes.

Diazotizable Direct Dyes—These may be applied to union goods by dyeing the cotton first at 140° F., rinsing, diazotizing and developing, and then cross dyeing the wool with an acid dye.